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MEETING OF THE NATIONAL TELEPHONE ASSOCIATION.

General C. H. Barney, secretary of the National Telephone Exchange Association, has issued the following interesting circular letter concerning the Minneapolis Meeting:

NEW YORK CITY, May 31, 1889.

DEAR SIR:

For the accommodation of delegates and others from the East, proposing to attend the next meeting of this Association at Minneapolis, the Pennsylvania Railroad Co. propose to run a special vestibule train of Pullman cars of the very latest pattern through from New York to Minneapolis without change. The train will consist of five cars, three sleepers, one dining car and one composite car, containing smoking room, library, bath room and barber shop.

It will be run as the second section of the famous "Chicago Limited," leaving New York on Sunday, September 8th, at 9 A. M., arriving in Chicago 24 hours later. Monday will be spent in Chicago until 5.30 P. M., and Minneapolis will be reached about 8 A. M., on Tuesday morning.

This arrangement will enable delegates to take their ladies on the trip with the utmost degree of comfort, and several have already announced their intention of doing so, thus making of the trip a grand telephone family party.

Tickets will be only the regular fare, $38.50 including berth.

In order to secure this magnificently equipped train, it will be necessary to guarantee 18 passengers to each sleeper, or 54 in all. The train will take on passengers at Philadelphia, Harrisburg and Pittsburgh. New England delegates may leave home Saturday evening, in time to connect at the start.

If you are willing to join the party please fill up and sign the attached blank, and return to me promptly, as we must know what to depend upon, as soon as possible.

Yours truly,

C. H. BARNEY, *Secretary.*

Adjustable Condensers.

The condensers made by Mr. William Marshall, of New York, have long enjoyed the reputation of being standard for this line of apparatus, and Mr. Marshall has still further added to his reputation during the past year. The accompanying illustrations show, Fig. 1, an adjustable condenser such as is used in the Wheatstone automatic survice. Its total capacity is 6.75 micro-farads, subdivided as follows: 2, 1.5, 1, 1, .5, .5, .25. Mr. Marshall has recently made eight of these condensers for the Western Union Company, who are using them on the Wheatstone system, and it is stated, prefer them to any other make which they have heretofore used. Fig. 2 shows the form of condenser used in the British Government telegraph service with a total capacity of five micro-farads, subdivided into eleven sections as follows: 2, 1, 1, .4, .2, .2, .1, .04, 03, .02, .01.

Mr. F. W. Jones, of the Postal Telegraph Cable Company and United Lines Company, in a letter to Mr. Marshall states that his companies have been using a large number of these condensers with perfect satisfaction, and adds that he considers them superior to any other made here or abroad. Mr. George A. Hamilton, of the Western Union, contributes similar testimony.

Is the Coil in the Pyromagnetic Motor Efficient?

Mr. Edison has claimed, in his United States patent for a pyromagnetic motor, a stationary coil designed to establish a polarity in the armature at a right angle to that produced by the field-magnet, and as I observe that he has retained this feature in his British patent, I am prompted to propound a query which long since presented itself to me, namely, whether, if the polarization due to the coil operates in the manner claimed, the increase of efficiency due to it is not paid for in full at the dynamo?

While I hesitated to believe that both Mr. Edison and the experts of the patent office could have adopted a theoretically inoperative device, yet I have been unable, after a careful study of the subject, to reach any other conclusion.

If the power of the motor can be increased in this manner, then if an armature, rotating between the poles of a permanent magnet, is subjected to the influence of a stationary coil energized by a dynamo driven by the armature; or, even better, if another permanent magnet is used instead of the coil; then the armature should rotate perpetually, without the expenditure of energy.

While admitting that the action of the coil upon the portions of the armature which are receding from the poles of the field-magnet is favorable, I maintain that it will have an adverse effect upon the portions which are approaching the poles.

With all deference to the parties interested, the authorities of the patent office have apparently inadvertently, and under the pressure of onerous duties, allowed a claim for a feature which is at variance with physical laws; and it should not be considered a reflection upon the patent office corps, but rather upon the legislators who fail to provide for increasing the force and accommodations in a department the conduct of which is a credit to the nation, and the records of which are destined to descend to posterity as a grand memorial of the scientific attainments of the present epoch.

WM. B. COOPER.

FIG. 1—MARSHALL CONDENSER, USED IN WHEATSTONE AUTOMATIC SERVICE.

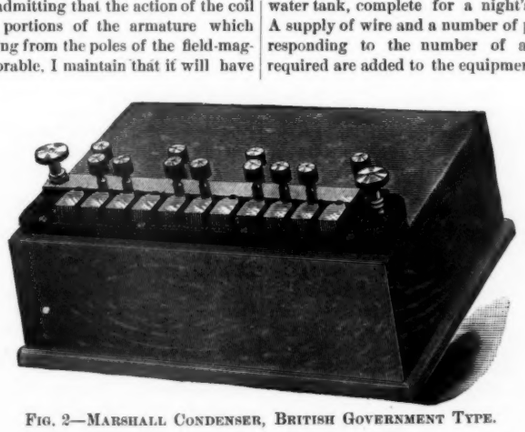


FIG. 2—MARSHALL CONDENSER, BRITISH GOVERNMENT TYPE.

An Electric Boat.

For the first time in its history, says the Toronto *Globe*, our bay was the scene of a novel event on Her Majesty's 70th birthday. An electric boat carried four gentlemen to the island and back. Messrs. E. and G. C. Wismer, the owners, and Messrs. Wm. Roberts, mechanical electrician, and Joseph Nicolls, assistant, were in charge of the experiment, which was watched with interest by Mr. James Beaty, Q. C., and Mr. Geo. M. S. Wilson, manager. Many citizens saw this experiment, which was intended to be a private one. The boat moved on the water like a duck. It showed how completely electricity is adapted to run a boat of any size. The Electricana Accumulator Company have their charter, and expect great developments shortly.

The storage cell was from the shop, 45 Queen street east, and was the Frippe type.

Travelling Electric Light.

A travelling electric light has been used in Germany with much success. The arrangement is a very simple one. A dynamo, with an engine to drive it, is mounted on a wagon, something like that of a steam fire engine, containing boiler, fuel box and water tank, complete for a night's service. A supply of wire and a number of poles corresponding to the number of arc lights required are added to the equipment, which is then drawn by a pair of horses to any desired place. On arriving there, the poles are set up where required and stayed with wires fastened with stakes driven into the ground; the lamps are then hung to them and properly connected, and the engine is set in motion. The lights immediately kindle, and from one to 50 lamps can be operated, according to the power of the machine. As the lamps can be suspended anywhere, and are not affected by wind or rain, the advantage of the apparatus to contractors and others who have to carry on night work is apparent.

ELECTRICAL POSSIBILITIES AS VIEWED BY A BUSINESS MAN.

An Address by Erastus Wiman Before the Electric Club.

The lecturer of the evening was introduced by Vice-President O. E. Madden, and amid much applause addressed the Club as follows:

Gentlemen, I must crave your indulgence for, as your good vice-president has said, I am hardly in a condition to talk to you to-night, and especially as the subject of electricity is one of which I have very little knowledge technically.

While just enjoying one of the delightful dinners of your Club, I heard a friend say that I would be all the more welcome to the Club, because I knew so little, inasmuch as a good many members felt that they knew very little upon the subject themselves. It is unfortunate for me that your winning secretary should have won my consent to perform this task, for I am so ill at ease and so little at home in relation to it. If I had to talk of the great mercantile agency with its 135 branch establishments, which I have the pleasure of being connected with, and to tell you of its great area of usefulness and advantages, I might talk to you intelligently. If I were to talk to you of the telegraph system of Canada, of which I am president, I could tell you something perhaps of interest as to our progress in electricity in the Dominion. If I were to discuss the advantages of base ball, as an economic device for the promotion of the gospel of relaxation, or still further, the prospects of Staten Island, the greatest suburb of the "greatest city of the greatest country under the sun," I should be at home; or if I were to tell about the Battery being the great focal point of North America at which all roads end, and from which reach out immense interests involving harbor enlargement and suburban development, I might talk with some intelligence.

I might tell you, too, something about that representative of America, who is electrifying Paris at present, whom I brought to Staten Island to achieve a career of fame—Buffalo Bill. I might also talk to you of the strained condition that New York is in, as a business center, fulfilling her destiny and maintaining her supremacy at an excessive cost, and about Staten Island as a point that will revolutionize the tax upon commerce of this port, and interest you perhaps when I tell you that on that island alone can there be simultaneously performed the three great factors of commerce, viz: receipt, storage and shipment, with a maximum of advantage at a minimum of cost. To-day we are receiving in Jersey City; we are storing in Brooklyn, and we are shipping in New York; involving a treble tax on every ton of produce exported or imported, while this could be done at one-third the cost, simultaneously, on Staten Island. Again I might talk to you familiarly about commercial union with Canada, and the abolition of the great barrier in the shape of a customs line which divides the two halves of the continent, and indulge in

the hope that the English speaking communities of this country may yet be united commercially.

With all these subjects I would be on familiar ground. But to-night I am before you to talk about a subject in regard to which I hardly know where to commence. It is almost a species of cruelty to ask me, ignorant as I am upon the subject, to address men so trained in such lore as are the members of this club. But I will do the best I can to tell you how this thing strikes a business man; and the first thing that impresses him is that there is no force that so perfectly enshrouds and involves a business man to day as does electricity. It is the strangest thing how greatly it has increased the activity of a business man. Even the brevity of the telegraph, by which he can dash off a letter in ten words, compresses a business man's efforts to a degree that he never dreamed of before. He never would sit down and write a letter in ten words; but he sends an important message by telegraph with that number of words and thinks nothing of it. One would think that the whole earth was surcharged with electricity, and that the whole business atmosphere of the world was equally surcharged with activity, simply because of the presence of electricity, that wonderful agent of Providence; and if to accomplish results quickly, close transactions promptly, and generally to get through with things, is a step toward a business man's millennium, then we must be nearing that heavenly expectation.

How electricity shapes a man's character and develops his capacity, how it enables him to accomplish more within a given space of time, how much men's efforts are doubled up and their achievements quadrupled, is patent to all observers. The ability to communicate with all parts of the globe by the use of the cable, the means of instantaneous communication with the most remote places; the power to command the movement of the products of every clime; the facility with which money is transmitted, all enormously adds to the power of man's accomplishment and achievement. It makes him almost omnipotent, that he can in an instant communicate with the remotest parts of the earth. The means of communication, which are the signs of the highest forms of civilization, are the most perfect by aid of electricity, simply because they are instantaneous. There is no competition against instantaneousness. There can be nothing quicker than the instant thought, the instant flash of thought from one end of the globe to the other. Man's power of communication through the ocean, and under the ocean to all parts of the globe, make him almost divine in what he can achieve. But great as may be his efforts with regard to the ocean, and to the distant climes and distant countries, the land lines do infinitely more for the business man. I never go up into that wonderful operating room of the Western Union Telegraph Company, but I am filled with amazement at the marvellous force and power that is latent there in its ability to communicate with all parts of this great continent of magnificent distances. The facility afforded to business men by such an organization as the Western Union Telegraph Company, is simply enormous, and reaches a facility for the transaction of business greater than all other forces and powers combined.

When you remember that all places within the three oceans, the Atlantic, the Pacific and the Arctic, and the Gulf, are accessible almost instantaneously, for a very moderate price, and that you can communicate and get back an answer in a very limited time; that you can go to every city in this land, and on almost every corner find means of access to almost every other corner, at a very small price, it has seemed to me that we have not yet woke up to a realization of the magnitude of the advantage that is in the hands of the business man. The Western Union is a magnificent combination for a business purpose. It is a uniform electrical effort in all parts of the country. It has been created only by a union of effort in numerous localities, sometimes inaugurated by public spirit, sometimes by the necessities of the community, not infrequently by a competitive desire, sometimes by a bitter feeling provoked by what appeared to be a neglect of public interests and the development of a monopolistic tendency. But there it is to-day the strongest and most comprehensive organization of electrical effort in the world. I happen to be on the committee of the Western Union board that examines the securities every year of the Western Union Telegraph Company. They have eleven millions of these securities, and it takes about three afternoons for three weeks in the summer to examine them.

I never go through these strange accumulations of securities without realizing that we are walking all the time in a great graveyard of electrical possibilities made impossible. Every package of papers contains evidences of an effort made, and two-thirds of the time a disappointment met, till one reaches the conclusion that competitive telegraphy is an impossibility; no man can be familiar with the Western Union Telegraph Company but he realizes the fact that of all departments of human effort there have been more failures in competitive telegraphy than on any other, that in proportion to the money invested, less has been made by the general public than in any other department of business life.

But great as may be that which a man can accomplish and the added business facility arising from the telegraph land lines, it is insignificant in comparison with his use of telephone. To my mind, of all electrical inventions that man ever created, the telephone is the most marvellous, the most useful, the most available and the cheapest in proportion to the service it performs. I remember once when Sir John Pender was here—it is not very long ago—I picked up in the Western Union office the list of subscribers of the Bell Telephone Company, in Providence, and said to Mr. Gould, who was standing near me, "You see these 2,000 names—these names of big houses and large manufacturing firms—these 57 banks in the list all use the telephone. Now is the time to buy the telephone; you can get it now for five or six millions and if you sell Mr. Pender this amount of Western Union stock at the price he wants it at, and with the proceeds buy out the control of the Bell Telephone, you will consummate a business operation the most influential that ever took place in the world." Had he done so, what I prophesied would have come true already. Every one of those banks and firms and manufacturing concerns would then have been an office of the Western Union Telegraph Company and that company would have been supreme as an army of occupation. Now they are not competitors; to-morrow they may not be less than that; perhaps in ten years they will be positive competitors, with the advantage to the telephone that it will have its office in every bank, in every business office, while the Western Union Telegraph Company will have its location on a corner of a street some distance away. When men can talk by vibration from one end of the country to the other, when they can talk to their customers, when without the aid of an operator instantly offer stocks, salt, sugar, or any thing else they have got to sell, and equally communicate with all their immediate environment, as with any city such as Boston, Philadelphia, Hartford and Providence, it seems to me that the electric possibilities from a business point of view are simply illimitable; and that electricity has done more and will do more for the business man than any other influence under the sun. It is just beginning to dawn upon us what an enormous facility this force has created for the use of the business man.

One would think that the ability to send a dispatch in ten words and to have an almost instantaneous reply from any part of the world; to talk freely over the telephone would so facilitate business pursuits and close up transactions so quickly that it would beget leisure, rest and quiet, but such is not the case. Thet hirst for achievement is so great, and we are so fearfully and wonderfully made, that the more we do, the more we seek to do. It would seem as if electricity as it stimulates the nerve centers and promotes the circulation of the blood in the human body, so stimulates the business pulse that we are harder worked than ever, have more to do with more pressure upon our time.

No wonder that Herbert Spencer, when he came to this country, was struck with this ceaseless activity, and said that of all gospels that needed to be preached, the gospel of relaxation was the one most needed for the American people. A sorry instance of this is before you to-night, attempting to interest you for a few minutes upon a subject with which you are all familiar, about which, on the other hand, he knows nothing at all, except to note its ulterior influences. Yet we are all so strangely different; all running in grooves so decidedly apart from each other, that we may be benefited by looking at these subjects from different points of view, and I shall be happy indeed if I should give you a single thought different from that which you already possess as to the possibilities of electricity for the business man.

If one is to judge what will be accomplished in the next 50 years by what has been done within the last 50 years, what will be the result to the business man. Notwithstanding all that has been achieved in the last 50 years, we are progressing electrically at a rate that is simply marvellous. What new powers will be developed no one knows. Perhaps, ultimately, electricity will be drawn directly from the sun. It may be there will be no intervening device which will have to be operated to get it directly from the heat stored in coal, which ages ago was derived from the sun as the source of all heat and power. The miraculous is always possible in a power as subtle as electricity.

For instance, what possibilities are not resident in the use of the latest electrical device, the phonograph? The transmission of the human voice, the storage of thoughts, the communication from one age to another of the intonation, the emphasis, and the force of eloquence, song or command, where will it end? In business, the phonograph will play a most important part. Personally it will enable men like myself, who begin work at four o'clock in the morning, instead of laboriously writing out our thoughts, to pour them into the cylinder of a phonograph, pocketing it, and hand the result to a typewriter, increase one's capacity for work fourfold. For the transaction of business away from business, for immediately discharging some forgotten correspondence, and for instructions to subordinates, the phonograph at home will be of an immense service. One seems to be dreaming when the possibilities in business are estimated, as resulting from the uses of electricity.

To-day, we can talk to Boston, Baltimore, and Philadelphia as plainly as I am talking to you. If the same ratio of progress is made in the next 50 years as in the present half century, no one knows what will happen next, and if the business millennium consist of adoing and achievement, it will be brought around by electricity. If money can be made by the frequency and rapidity with which business is transacted, we would be the richest nation under the sun. The only trouble is that the more business we do the more we are stimulated by the electricity to activity, the more competitive become our efforts; and the more competitive the less profitable does business become. This is a singular change. Competition used to be considered the life of trade, it is getting to be the death of profit. (Laughter.) Unrestricted competition is the most expensive luxury the American people are now indulging in. Amid the blinding fury with which combinations are regarded, events have nevertheless proved that there is more disaster and more expense in competition than is in all the combinations ever made. There is no department of human effort in which competition has been so disastrous, and will continue to be so, as in the electrical business in which we are all so much interested. If by any human possibility, all these vast interests, which are few and easily controlled could be brought together, and by combination work out their own salvation in some other place than a court of law, it would be a mercy indeed. If this insane desire to get a little the better of one another could be tempered, and if the various conflicting interests could be brought into line, so that we would have a great electrical trust made of the various electric warehouses, light companies, systems, etc., if we could have something of that sort done, the electrical millenium would seem in sight.

* * * * *

During the Napoleonic wars England issued a very large amount of consols at high rates. These have been falling due for some years, and the Chancellor of the Exchecquer has been converting them into new issues at as low a rate as two and a half per cent. interest, thus cutting men's incomes right in two. With a desire to reinvest, the field for safety and profit is limited. Russia, which was formerly a great absorbent of English capital, is no longer the attractive field, for it is presumed she will have in time to repudiate, owing to the enormous military expenditure. France wants no more English money, and Germany needs none, while the English investor finds no profit in land. There is, therefore, an absolute necessity for English money to find an outlet in this country.

The attractiveness of the United States as field for investment is shown by the marvellous progress made by this country, its magnificent career, marked just now by that splendid centennial which we all helped to celebrate. It is no wonder capital comes hither when parties from abroad recall the tremendous progress that has been made, how stable and strong and firm this government is, how it is absorbing European immigrants at the rate of five thousand a day and assimilating them and making citizens and men out of them. When one thinks of the progress of the reduction of our debt and how trivial it is compared with what it was and what it is in comparison with European national debts, and when you think of the enormous surplus we continue to accumulate—how strange would it not indeed be if English capital should not come in this way? Why, this is the only place in all the world where it can be well and safely invested, and I look forward to hundreds of millions of English capital coming in this direction. If things go on at their present rate, before twenty-five years are gone one-third and perhaps one half of the great industrial combinations of this country will be owned in England. With this amount of money in prospect it is a great pity that electric securities are not put in their most attractive shape. With proper management there is nothing in the world that the Englishman will find better and more safe as an investment, and with some unity of purpose and harmony of action it could be made the fashion to invest in these securities as it has become the fashion to invest in breweries. With this in view, would it not be a good thing to have a great electrical trust to control and make profitable all the ready inventions of the age, and to administer this growing business in a manner similar to that other great adequate light producer the Standard Oil Company? Light by that organization has been cheap and yet a large profit realized by its promoters. Mr. Villard has been a great friend to Mr. Edison and he with Messrs. Drexel, Morgan & Co., were the first to help him to promote his inventions. Jointly, they have just now formed a great company of twelve millions of dollars to take over all the Edison plant. It may be pretty hard to say what this large capitalization represents in the shape of solid dollars, and yet no doubt, with the properties it can earn a very good dividend upon this amount. How much more profitable would be the dividend if the stock was doubled and trebled, and made to include all competitive undertakings. How much better if the prospect of interminable litigation was also eliminated, and a hearty and united action were for once agreed upon to make money by legitimate and business like operations of the age of combination for mutual benefit and the eventual benefit of the public. If this movement could be anticipated by some kind of organization to report and pass upon electrical securities, and give an intelligent and impartial judgment on them, it would

be most desirable. Enterprises all over the country, necessarily helpful and useful and profitable, are struggling and having a hard time generally, and not doing the work as well as they otherwise would do if they were easier financially. This could be remedied either by an endorsement of some strong concern, or by a thorough investigation, of learned and impartial experts, as in securities of other undertakings, if electrical possibilities are to be what a business man desires. Men with money in electrical properties feel like suggesting that guardians should be appointed, when he takes up his morning newspaper to find such giants as Edison and Westinghouse fighting and disputing at the rate of loss per day that is simply impossible to estimate, when by a union of both so much that is possible and progressive could be accomplished. It is most unfortunate that the electrical securities stand in their present position. Let us hope that some plan will be adopted by which business acumen, business sagacity and business prudence will steer them in these days of consolidation and combination into a safe harbor of profitable quietude. My friend, Frank Thurber, taught me a saying from a French economist in these words: "When fortunes were made by war, war was a business; but in these days when fortunes are made by business, business is war." (Laughter.) Now that is so, electrically, at the present moment and the war ought to cease and peace be declared.

Once there came to this world a Saviour, whose life was a strange admixture of good to the body and good to the soul. When He left this world, that which was good for the soul He left behind; and the gospel of kindliness, the spirit of doing unto others as you would be done by, and all the great and glorious influences of Christianity were inherited by poor humanity that sadly needed them. It was supposed, however, that He had gone and taken with Him the power of curing, and that no longer would the miracle be performed, no longer would the touch cure, and that the influence which on each he used was lost to mankind forever. But it may not be so. That power that we speak of to-night, that marvellous power which is so subtle, which is so mysterious, is equally miraculous. It is available for us all, is with us still, a revelation to us. We should thank God that we live in an age and in a time when, with these electrical minds that are before me now, we are daily discovering new uses for that power, and among them not the least the power to mitigate human suffering and to prolong life. If in all the wide range of that which we are to be grateful for, we include electricity, we include a large portion of all this, for in our every day pursuits, in our thoughts and in all that surrounds us, the electrical influence and force is very pervading and useful and available for our use. I can never feel that I have anything to be more grateful for than to live in the age when men like Morse, Edison, Bell and Field and other great benefactors have put into active force and usefulness this great force and power. And I am grateful, as we all should be, that we are born in this age when so much is achieved for the good of man, and developing by the power of electricity the marvellous providence of God, realizing those beautiful old lines:

"When all Thy mercies, Oh my God,
My rising soul surveys;
Transported with the view, I'm lost
In wonder, love and praise.

—— The organization of the Thomson Scientific Club has been recently perfected at Lynn. The objects of this club as set forth by its constitution are to disseminate scientific, technical and kindred knowledge among its members, to promote the general interest of its members in acquiring such knowledge, to extend social and scientific intercourse among its members by providing a suitable place of meeting, a library and such other appurtenances as may be found desirable. Over 80 persons have already signed the constitution. The officers are as follows: President, Professor Elihu Thomson; first vice-president, E. Wilbur Rice, Jr.; second vice-president, Chas. J. Van Depoele; secretary, H. Bottomley; treasurer, W. S. Gorton; reviewer, G. F. Curtiss; executive committee, W. H. Blood, E. E. Boyer, C. F. Medbury, J. E. Randall, J. Riddell.

The Suitability of Platinum-Iridium Wire and Some Other Alloys for the Construction of Standards of Resistance.

Let s be the specific gravity, k the conductivity at 16°–17°, mercury being taken as unity, e the thermo-electro-motive force with copper in microvolts per degree, p the temperature coefficient per degree; then the following values have been found for various alloys:

Alloy.	S	K	e 0-17°	e 0-100°	$10^4\ p\ \frac{16.5}{40}$	$10^4\ p_{16.5}$
Platinum-Iridium	21.60	3.78	7.14	7.15	1264	1250
Bare Nickelin	8.96	2.90	28.3	33.2	180	185
Covered Nickelin.	8.96	2.91	28.7	33.9	180	183
Bare Ger. Silver.	8.62	3.84	9.75	11.47	396	380
Cov'd Ger. Silver.	6.64	3.60-3.67	11.1	13.2	367	360
Platinum-Silver	.....	2.11	6.62	.....	371	267

With copper and nickelin or copper and German silver, the thermo-current flows across the warm junction to the copper; in the two platinum alloys the direction is the reverse.

On comparing the resistance coil at intervals of ten months with a mercury standard small differences were found which were sometimes positive and sometimes negative, and varied from 0.019 to 0.064 per cent. Small deformations have but little effect on the resistance. The two platinum alloys and covered nickelin show a small secular decrease. Repeated deformations, such as bending and unbending, have considerable effect. If the resistance of the wires before being heated to glowing is equal to unity, then the resistance afterwards when reduced to the initial temperature (16.5°), is:

Platinum-Iridium	0.97243
Bare Nickelin	1.00789
Covered Nickelin	1.00725
Platinum-Silver	1.01393
Bare German Silver	1.00366
Covered German Silver	1.00824

Stretching and torsion increase the resistance in each case; the increase may be transient or permanent according to the length of time during which the force acts.

The rate of cooling was also very carefully investigated. If T is the temperature of the wire, t that of the surrounding medium, S the specific resistance at t, i the strength of the current used to heat the wire, r the radius of the wire, a the coefficient for temperature, and A the constant of the cooling, then

$$\frac{i^2\ S\ M}{r^2\ n}\left\{1 + a(T-t)\right\} = 2\ n\ r\ A\ (T-t),$$

and, if a is small, for wires of equal diameter and for equal currents,

$$T - t = \text{const.}\ \frac{S}{A}.$$

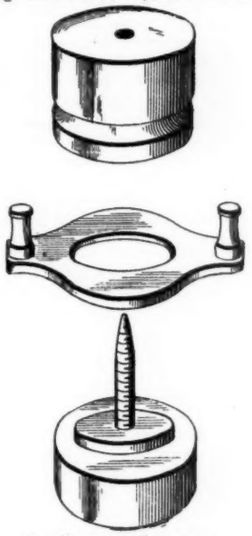
The actual wires were not all of the same diameter, otherwise the values of A, which varied from 0.00091 to 0.00133, would have been equal.

The author concludes that platinum-iridium and platinum-silver are the alloys which best meet all the requirements. The high thermo-electro-motive force of nickelin when in conjunction with copper is an objection to its use for a standard resistance, though its low temperature coefficient is favorable to its use in resistance boxes.—*Beiblatter.*

—— The Consolidated Electrical Association of Maine has contracted to put in 56 incandescent lights into Hon. Frank Jones' cottage at Sorrento and also to put 30 lights in Dr. Robert Amory's cottage at Bar Harbor.

An Ingenious Insulator.

The insulator shown in the illustrations herewith is the invention of Mr. J. C. Berrang, of Asbury Park, N. J. Its object is to provide a simple, cheap and neat device for stringing wires. In insulators heretofore constructed, it has been necessary to provide a tie wire, or take a complete turn of the main wire around the insulator, which is not only an unsightly arrangement, but also makes it almost impossible to string the wires taut. In this arrangement the tie wire is entirely dispensed with, and the wires can be drawn taut and held in place in one-half the time and with less trouble than in the old way. As will be noticed, the insulator is composed of four parts, the two insulating blocks, the screw and the plate, the latter being held between the insulating blocks and having diametrically opposite extensions,

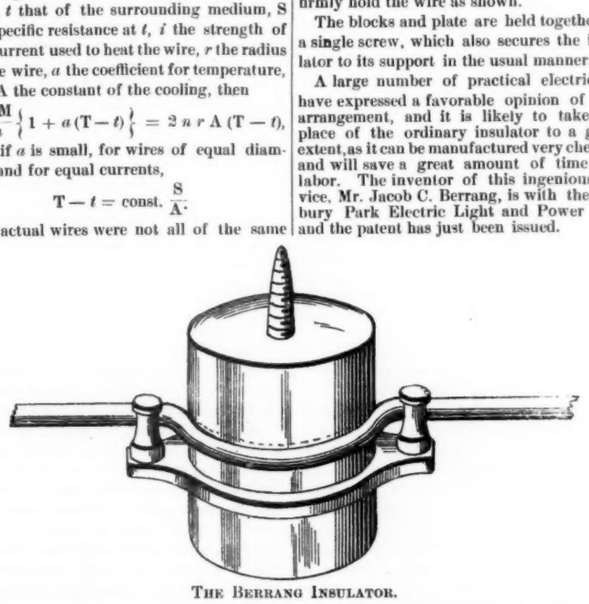


The Berrang Insulator.
(Showing parts).

provided with vertical retaining arms, which firmly hold the wire as shown.

The blocks and plate are held together by a single screw, which also secures the insulator to its support in the usual manner.

A large number of practical electricians have expressed a favorable opinion of this arrangement, and it is likely to take the place of the ordinary insulator to a great extent, as it can be manufactured very cheaply and will save a great amount of time and labor. The inventor of this ingenious device, Mr. Jacob C. Berrang, is with the Asbury Park Electric Light and Power Co., and the patent has just been issued.



The Berrang Insulator.

Independent-Support Arc Light Hanger.

A new arc lamp hanger is being made by the Electrical Supply Company of Chicago. The valuable feature about the hanger is that the lamp is not supported by the circuit wires, the weight being upheld entirely independent of the conductors. Other advantages claimed for the hanger are simplicity, positive action and non-liability to get out of order. The Supply Company has issued a folder describing and illustrating the hanger.

—— Business with the Amesbury (Mass.) Electric Company is booming. The current for running the street cars to Merrimac is to be furnished by them. A new dynamo is to be put in and to be running by June 17.

New York.—Howe Electric Manufacturing Company, of New York; capital, $50,000.

Redwood City, Cal.—The Redwodo City Electric Light Company; capital stock, $20,000. A. J. Marcus, Albert Hanser, J. L. Ross and others incorporators.

Memphis, Tenn.—The Tennessee Phonograph Company is being organized by W. M. Duncan, of Nashville, and others. Capital stock will be $228,000.

Chicago, Ill.—The National Telegraph Press Association of Chicago, filed a certificate of increase of capital stock to $100,000, and the number of directors to five.

Chicago, Ill.—Steel Welding Company; location, Chicago; for welding and hardening of steel, etc.; capital stock, $100,000; incorporators, Julius Wahl, Charles F. Clarke, and Thomas C. Rivera.

Chicago, Ill.—Electric Motor Renting Company; location, Chicago; to purchase or lease electric motors, dynamos and other machinery; capital stock, $30,000; incorporators, D. Dichington, C. A. Robinson and M. D. Black.

East St. Louis, Ill.—The Secretary of State has issued a license of incorporation to the New York Zinc and Lead Company, of East St. Louis, with a capital stock of $1,000,000, and with Asa W. Day, E. B. Wilder and W. B. Homer as incorporators.

Oswego, N. Y.—The Oswego, N. Y., Fuel and Lighting Company has been incorporated. The incorporators and directors are John D. Brown, of New York, Winfield Clark of Albany, and James F. Herrick, H. D. McCaffrey and W. A. Poucher of Oswego.

Hartford, Ct.—A storage battery electric car sent to Hartford, Ct., on trial, and which could not be tested there because of defective tracks, is to be tested on the Fair Haven and Westville road in about two weeks. New open cars for this road are now expected from Philadelphia.

Salem, Ore.—Articles of incorporation were filed in the Secretary of State's office by the Pendleton Telephone Company; capital stock, $4,000; J. E. Bean, F. J. Donaldson, John Gagen, G. W. King, J. S. Murphy, J. H. Raley, L. Reith and J. P. Wager, incorporators.

Camden, N. J.—The Universal Motor Company has filed articles of incorporation in Camden, with an authorized capital of $2,000,000, of which $1,000 is said to be paid in. The incorporators are William A. Bennett, of Philadelphia, and Henry L. Jones and Charles E. Evans, of Camden.

Haverhill, Mass.—A syndicate has been formed in Haverhill, Mass., for the purpose of building an electric railway from Haverhill to Rowley, via Georgetown, which will eventually reach Newburyport on one side and Lawrence on the other. A street railway will soon be built from Exeter to Amesbury.

Seattle, W. T.—Woodland Park electric railway; incorporators, Guy C. Phinney, Daniel Jones and Benjamin F. Day; capital stock, $100,000, in 10,000 shares of $10 each. The incorporators will serve as trustees until the regular annual meeting of stockholders on October 15th, 1889. The objects of the corporation are set forth in its name.

Boston, Mass.—Electric motors and hoisting apparatus are to be put into the recently consolidated Atlas Stores belonging to the Boston Wharf Company. The whole property covers an area of about 150,000 feet, having nearly 900 feet of deep water frontage and over 1,200 feet of street frontage on Congress and Sleeper streets, making, with one exception, the largest public warehouse property in the city.

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We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, JUNE 15, 1889.

CONTENTS.

	PAGE.
Meeting of the National Telephone Association.	1
Adjustable Condensers	1
Is the Coil in the Pyromagnetic Motor Efficient?	1
An Electric Boat	1
Travelling Electric Light	1
Electrical Possibilities as Viewed by a Business Man	1
The Suitability of Platinum-Iridium Wire and Some Other Alloys for the Construction of Standards of Resistance	3
An Ingenious Insulator	3
Independent-Support Arc Light Hanger	3
New Corporations	3
Safety Appliances for Electric Cars	4
Latest Electrical News from All Points:	
Our Chicago Letter	5
Southern Electrical Notes	5
Our Nebraska Letter	5
Our Toronto Letter	5
Personal	5
Telephonic News	6
The Telephone Ear—It's the Left One	6
A Spider Web Telephone	6
The Strength of an Induced Current with a Magneto Telephone Transmitter as Influenced by the Strength of the Magnet	6
Electrical Development	6
Lightning and the Electricity of the Atmosphere	7
The Halifax Carnival	7
Telegraphic	7
Electric Power	8
Municipal Lighting	8
The Pelton Water Wheel	8
Auxilary Accumulator Cars	8
New Central Station, Salem, Mass	9
Electric Light News	9
Manufacturing Notes	10
Secondary Batteries	10
Babylon Electrified	10
Electrical Patents	10

Electric welding has given quite an impetus to many industries. At Worcester, Mass., the makers of a new hoop are using the process and find the saving over the ordinary mode immense, as a hoop can now be welded in two seconds. The hoop itself is of a corrugated steel, for use on flour barrels, and four steel hoops now take the place of ten wooden ones.

The establishment of electrical engineering courses and professorships of electrical learning at several more of our American colleges brings them into line with the older universities and scientific colleges wherein electricity has long received its merited place in the curriculum, and which are turning out each year scores of young men who are rapidly absorbed in the business, where they soon find there is room for the practical side by side with the theoretical, and that best results are obtained by an harmonious combination of the two.

Some interesting candle power tests have been made in the streets of Salem, Mass., by Lieut. John Millis of the U. S. army to settle a controversy between the local company and the municipality as to fulfilment of contract.

The tone of the editorials in the daily papers throughout the country on the subject of electric power for railway purposes is very favorable. This is not surprising. It could not well be otherwise, and yet it will tend to hasten action which might otherwise be delayed.

Our English contemporaries are commenting extensively on the peculiarities of American cities, as exampled in Boston granting overhead wire privileges for the street railways, just as New York is taking down poles and wires by wholesale. Boston always was a trifle independent.

The much abused ticker has proved itself to be an indispensable adjunct to modern civilization, and for four days, this last week, it seemed to the business world as if there was no living without it, just as it had seemed previously as if there was no living with it. The ticker is not the only condemned modern improvement that has proved its usefulness as soon as it was dispensed with.

As in other matters the electrical fraternity have proven themselves at the fore in the time of urgent need. The telegraph operators at Johnstown and vicinity made heroes of themselves, electric lighting companies aided largely in the sad work of recovering bodies of the victims of the flood, by promptly furnishing temporary lighting plants, and in the lists of contributors electric companies and their employés are prominent.

Why not, in a preliminary experiment on the question of death by electricity, smooth the way for prompt and effective execution of the death sentence? Make the test upon a human subject—for instance, on Harold P. Brown or Elbridge T. Gerry. We fancy their resistance would be high enough to forever settle the question as to the amount of electrical energy required to carry the toughest and most hardened subject across the Styx.

One of the benefits of electricity for a business man which Mr. Wiman failed to mention, but which he would realize were he to pass along Park Row these summer afternoons, is the playing of a baseball game on a blackboard with wooden men, acting simultaneously with their counterparts of brawn and muscle on the green diamond. Here the game goes merrily on whether the original be at Staten Island, Boston, Philadelphia, or in the West, electricity again annihilating space.

It was less than two years ago that there was quite an expression of public opinion in England against the proposition to hold electric light and telephone conventions, and it was forcibly argued that the word convention itself was eminently American and totally unsuited to the serious and grave requirements of English electricians. We are pleased to note, however, that a telephone convention is to be held in London on July 11, 12 and 13. The enterprise is backed by some of the most distinguished electrical people in England, and we have no doubt that the occasion will be as profitable as the well known and admirably managed telephone conventions of this country.

The electric companies which are in the field for street railway motor work are pushed to their utmost capacity, and hardly a day dawns that does not bring with it the news of the substitution of electric for horse power on streets railways, north, south, east and west. The query naturally arises, what will be the effect of this sudden displacement in the horse market? No one who is cognizant of the rapid using up of horses which is going on in every city in the country where street railways exist, can but rejoice at the change if only from a humane point of view, and the great law of supply and demand will doubtless take care that no appreciable effect will follow on the quality or price of horse flesh.

It is not often that a daily newspaper gets at the true inwardness of electrical matters nor, if it does, finds it for its advantage to occupy its columns with matters which are of interest to but few of its readers. The New York Daily *World*, in its issue of June 7, indulged in half a column of rather plain talk on the subject of the approaching execution by electricity of a criminal, in which the truth was told with a directness and ingenuousness much to be commended. The apparent effort to prostitute a valuable and eminently useful system of electric lighting apparatus to the ignoble purpose of killing criminals should receive a proper airing before the general public through the daily press.

The Massachusetts Senate judiciary committee has reported a bill amending sec. 37, chap. 215, Public Statutes, so as to read: "The punishment of death shall in every case be inflicted either by hanging the convict by the neck until he is dead or by causing to pass through his body a current of electricity of sufficient intensity to cause death, and the application of such current must be continued until such convict is dead. Such punishment of death shall be inflicted in the manner in which the judges of the court at which the conviction takes place shall determine, agreeably to the provisions of this section, and the sentence shall, at the time directed by the warrant, be executed within the walls of a prison of the county in which the conviction was had, or within the inclosed yard of the prison." The act to go into effect Jan. 1, 1890.

Lead is a metal that plays no unimportant part in electric industries, and the present effort of Standard Oil capitalists to make a lead trust is not a movement calculated to make that metal cheaper to the manufacturer. We have noticed that manufacturers often make an excuse for advancing their prices considerably because of a very small increase in price of the raw material. It was often remarked during the recent high prices on the copper market that when manufactured into insulated wires the price increased in a greater proportion than the increase of cost of ingot copper. The lead accumulator or secondary battery is steadily making its way among users of electric light apparatus, though the objection of high prices is often heard. It is to be hoped that the prospective jockeying in the lead market will not seriously appreciate the market prices of this useful apparatus.

The old laboratory experiment with which, in our younger days, it was customary to teach how it was possible for a lightning flash to travel many miles through the air, has received a practical demonstration this week. We all remember the glass tube, of large bore, on the inside of which, equidistantly and spirally, were arranged bits of tin foil which were made the path of a disruptive discharge from a friction machine or other convenient source of static electricity, the spark jumping from one end of the series of tin foil to the other with ease, though it would not be able to jump an equal amount of air space. It is not proposed here to defend this experiment as a means of explaining the long and wondering lightning flashes which are occasionally observed, but to refer to a phenomenon which occurred on Monday in North Dakota. The air was dark with an immense flock of ducks which fairly blackened the sky. A thunder storm was gathering, and as the closely packed mass of birds passed under the black clouds there was a blinding flash of lightning, and several thousands of ducks fell to the ground lifeless. Undoubtedly their bodies, close together and filling as a whole a considerable depth in dry air underlying the clouds, considerably reduced the total resistance of the path from cloud to earth, and the disruptive discharge took place.

SAFETY APPLIANCES FOR ELECTRIC CARS.

The unfortunate accident by which a young man recently lost his life at Cambridge, Mass., while endeavoring to board a tow car on the electric road, draws attention to the necessity for the adoption of fenders and every other safety appliances in order to meet the requirements of increased speed and running trains instead of individual cars. Without being in the least responsible or meriting the slightest blame, electricity will have to shoulder the blame and bear the prejudice should these accidents prove of common occurrence, and it therefore behooves the electric companies supplying the equipment, to demand of the local companies such precautions as the new motive power seems to call for. In this connection the report of the Massachusetts railroad commissioners in the case mentioned above is of interest. In it the commissioners say:

"The object of investigation by this board is not to determine liability for damages, but to discover whether similar accidents are likely to occur again, and, if so, to suggest such precautions as should be taken. If such trains are to be run, it seems clear that the present safeguards are insufficient and unsatisfactory. In the first place, there should be a continuous bell cord running from the rear end of the rear car to the front platform of the first car. The delay in transmitting the signal by the driver of the second car to the driver of the motor car is a source of unnecessary danger, and should be corrected without delay.

"The board has already by repeated recommendations advised the company that the safety of the public demands that the electric cars should be furnished with complete and effective fenders surrounding the cars on all sides, so that a person falling in front of such a car, or at its sides, would be pushed aside by the fender, and thus be saved from being crushed under the car. This board once more renews that recommendation, and advises its application to all cars used as tow cars. The fenders should be applied with the utmost expedition possible. In fact, so great is the danger and so serious the nature of the accident in case a person falls from a leading car in a train of two or more, that considerations of economy as well as of humanity demand immediate action. But whatever true economy may dictate, there is no question that the present practice is unnecessarily dangerous, is definitely bad, and it ought not to be continued."

THE ELECTRIC RAILWAY.

The introduction of electricity for lighting created a wide-spread interest throughout the country, not only in regard to the general principles involved, but as to the various systems in use. At the present time the introduction of electric power in all kinds of work, and especially in street car propulsion, has awakened even a wider interest, for those who perhaps bestowed but a few passing thoughts on the electric illuminant at the top of a high pole or securely covered in a small glass globe, feel a keen interest in the whys and wherefores of the movement of the street car which carries them from place to place. Mr. Fred. H. Whipple, well known as an expert in electrical matters and as the author of the book on municipal lighting, has written a book on the subject of electric railways which supplies just the information wanted, and will be as valuable to the general reader as to those directly engaged in electrical pursuits. The author first takes up the earliest stages of the discovery and development of electricity and methods of producing it, and devotes several chapters to the experiments of the early workers in the field. Mr. Whipple next enters into a discussion of the lines of magnetic force and their bearing on the production of motion, and then gives some interesting information concerning primary and secondary batteries.

In the remaining pages of the book, the application of electricity to underground and elevated railways, a valuable discussion of costs of producing, transmitting and applying electricity for street railway purposes, with comparisons with other methods, chapters on stationary motor work, steam power plants, utilization of water powers, and the purchase and care of belts, form interesting reading, and go to make up a complete review of the entire subject. The last chapter contains some thoughts on the possibilities of electric street car propulsion. The work is bound handsomely in flexible covers and handsomely and completely illustrated. ["The Electric Railway," by Fred. H. Whipple, Detroit, 1889.]

LATEST ELECTRICAL NEWS FROM ALL POINTS.

OUR CHICAGO LETTER.

Johnstown.—The principal topic of thought for the week past has been the awful calamity at Johnstown. Chicago feels keenly, and with good cause, when an appeal is made to her sense of justice and her generosity. Up to this A. M the total reported is over $75,000. The method adopted was to classify subscription lists, committees from each trade or calling being appointed, subcommittees under these dividing up the work so as to reach the uttermost end of the system. The work has thus been thorough and complete, as well as successful.

That the committee of electrical people, Messrs. B. E. Sunny, H. Ward Leonard, C. A. Brown, J. M. Jackson and C. T. Page, have done their work well, and that the electrical companies and employés have responded nobly, let the following attest. No one to whom the application was presented refused to give.

Chicago Telephone Co. and employés..	$93
Central Union Co. and employés	49
Knapp Electrical Works.....	25
Postal Telegraph Co. and employés....	100
Excelsior Elec. Light Co. and employés	21
Chicago Copper Refining Co.....	25
Englewood Elec. Light Co. and employés	15
Westinghouse Co. employés.....	57
Van Depoele Co. employés.....	70
Western Electric Co.....	250
" " employés.....	60
F. S. Gorton.....	10
Thomson-Houston Co. and employés...	212
Forèe Bain and employés	22
Chicago Arc Light & P. Co. & employés	78
Electrical Supply Co.....	25
Leonard & Izard and employés	64
Natl. Elec. Construct'n Co. and employés	13
Central Electric Co. and employés.....	56
Western Union employés	111

and collections are still coming in.

In addition to the above many electrical employés had already given their mites through other channels. The hello girls in the telephone office, God bless 'em, betrayed their womanhood by coming to the scratch like little men, if a body may be allowed the expression, and so did the typewriters and stenographers everywhere.

The electrical employés of the city went with either the police or fire department, both of which divisions of the municipal government answered grandly and cheerfully.

New Company.—The Town of Lake Arc Light Company, of Chicago, has been incorporated, for the furnishing of light to the Town of Lake, this county. The capital stock is $50,000 and the incorporators E. D. Petrie, A. R. Cottle and E. S. Mecalf.

Electricity as Fire Help.—An Eastern inventor suggests the use of street overhead wires to attach motor conductors to, and so run a fire engine by electricity. Too limited in its application, that. What we do purpose doing in that direction, however, is to have electric lights all over town—wires underground, you will remember—these wires brought up to boxes like fire alarm boxes near the hydrants, with terminals so that at a fire in the neighborhood a portable electric light can be let right into the circuit and burned for the benefit of the department.

The city that has street railways with overhead wires is able to have steam fire engines, and except where a fire was pretty tolerably near a street car track, the steam engine would be far better, quicker, and a large per cent. safer than anything attached by conductors to an overhead wire, on a circuit which would be liable to have from one to a dozen ground leaks whenever there was an alarm of fire.

A Veteran.—Mr. Don A. Palmer, who has been fooling with lighting ever since his short pantaloon days, by an unlucky turn of the political dice, has just been displaced from the position of Superintendent of the Fire Alarm Department in the Town of Lake. Don says this is worse than the rheumatism he had awhile since.

Blowing the Dynamos.—In the plant of the Chicago Arc Light and Power Company, a Sturtevant blower is run which gives an air pressure of about four ounces to the square inch, delivering a gentle breeze to several dynamos, through branch pipes. The device is said to accomplish a very satisfactory result in keeping down the temperature of the machine.

Changes.—The secretary and treasurer of the Chicago Arc Light and Power Company, Mr. A. F. Bennett, recently resigned to enter the service of Crane Brothers. Mr. C. H. Wilmerding, superintendent, has assumed the duties of the former position and will continue to fill his own as well.

Extension.—The company above mentioned has just purchased the King plant, and added it to its net work of lines. This plant which has been in operation for several years at the corner of Madison and State streets is using the Schuyler apparatus and has been very successful in every respect.

New Correspondent.—Mr. Fred. De Land has made his bow to the electrical public as western correspondent of the *World*, in place of Mr. Nichols, who has tackled a Chicago daily as reporter. C. C. H.

Chicago, June 8, 1889.

SOUTHERN ELECTRICAL NOTES.

A New Telephone Line.—John D. McClendon, of Atlanta, Ga., W. M. Gunter, of Bridgeport, and J. E. Brown, have formed a company to build a telephone line from Scotsboro to Guntersville, Ala., and contract has been let.

Electric Light Notes.—A new company is forming at Macon, Ga., for the purpose of erecting an arc and incandescent electric light plant. At the Covington, Ky., the Citizens' Electric Light and Power Company have purchased the plant and franchise of the Kenton Electric Light and Power Company.

Chance for the Motor Men.—The Bird Eye Coal Company, of Red Ash, Ky., contemplate erecting an electric plant to light their mines and furnish power for operating mine cars, and running mining machinery. They desire to correspond with electric companies with regard to cost of electric plant to haul coal in mines, lighting mines, furnishing power, etc.

Electrical Progress and Development.—A company has been organized at Georgetown, S. C., to establish a telephone exchange. The Buena Vista (Va.) Company will develop their water-powers and conduit power by means of electricity. The Washington (Md.) and Tenallytown Railroad Company will start work on their electrical railroad June 1st. It will be 4½ miles long.

New Lighting Plants, Additions, Etc.—The Hill City Electric Light Company, of Vicksburg, Miss., will add an incandescent electric light plant soon. A company has been formed at Elizabeth City, N. C., by C. Guirkin, Jr., to erect an electric light plant for both arc and incandescent lighting. B. F. Hanes, Winston, N. C., will put machinery for electric lighting in his tobacco factory. An electric light plant will soon be erected at Paris, Tenn. The Fort Worth (Texas) Electric Light Company are adding a motor circuit. C. L. Budges will erect an incandescent electric light plant later in the year at Navasota, Texas. At Charleston, W. Va., the Mohawk Heat, Light and Power Company, of New York, has filed articles of incorporation.

A Private Telephone Line.—Mr. G. W. Williams has become the sole owner of the telephone line between Wilmington and Masonboro Sounds, N. C. He has contracted for the thorough repair of the line to Masonboro, and it is probable that he may be joined by others on both Sounds in availing themselves of the great convenience afforded by the telephone.

Savannah's Electric Light Company.—At a meeting of the electric light company of Savannah, Ga., a few days since, the following gentlemen were re-elected on the board of directors: S. P. Hamilton, D. G. Purse, J. C. Rowland, E. A. Weil, L. Kayton, S. S. Guckenheimer, C. H. Wilcox, D. Y. Dancey, H. A. Crane.

The Company Well Named.—The Progress Electric Lighting Co., of Mobile, Ala., have just put in operation a new incandescent dynamo of the Thomson-Houston system, which is, without doubt, a beautiful specimen of machinery. This dynamo has a capacity of 500 incandescent lights of 16 candle power, but lights of 32 and 64 candle-power can also be furnished from the same current. The machine stands about five feet high, and the circular iron casing of the field magneto and armature is about two feet wide. The company has recently erected new 60-foot cypress poles, in order to get their lines out of the way of the erection of ladders in case of fire, and to accommodate increased business. E. A. O.

Charleston, S. C., June 1, 1889.

OUR NEBRASKA LETTER.

Tennis After Dark.—This city is fast becoming quite an electrical center. The tennis club recently had their spring opening and their grounds were brilliantly lighted by means of a number of arc lamps. Refreshments were served during the early evening, and the playing was continued until about 11 o'clock by the light of the electric lamps.

The Kearney Electric Company.—The Kearney Electric Company have had to erect a temporary building to accommodate the three additional 758 light Edison dynamos just installed by the Western Engineering Company. The electric company are putting up a very handsome three story pressed brick station, and all the dynamos have been set in their permanent places, the temporary building being for protection from weather. The new station will be built around the temporary house and then the latter will be removed. This plant has now a capacity of 30 arc and 3,500 incandescent lights.

A Novel Paper Mill.—Work on the new paper mill is progressing rapidly, and it is expected that the first paper mill in the country to be run entirely by electric motors will soon be in operation. The mill will have one 75 horse Sprague motor besides one 30 horse and several smaller motors, all of the same make, and purchased through the Western Engineering Company of this city, who are agents for several States for the Sprague Electric Railway and Motor Company, and for the Edison Light Company.

An Active Company.—The Western Engineering Company, which recently moved here from Lincoln, Neb., is very busy.

In addition to the above mentioned work, they have just about completed the construction of a tramway for the Kearney brick works, which is to be operated by Sprague motors, and is to haul the clay from the bank to the works, a distance of over three-fourths of a mile.

They are also constructing for the Sprague Company the Salt Lake City road, which has about seven miles of track and ten motor cars; and the People's Railway, at St. Joseph, Mo., which has nine miles of track and 20 motor cars.

The Western Engineering Company have also contracted with the Wyatt Park railway of St. Joseph, Mo., for the construction on an extension of their road of about two and one-half miles.

This same company has just completed the installation of a 2,250-light Westinghouse plant at Council Bluffs, Ia., besides several smaller central stations and isolated plants. Mr. J. G. White, manager of the Western Engineering Company, has recently closed contracts for the Sprague Company for two and one-half miles of road at Plattsmouth, Neb., with two motor cars; and also for a large road at Omaha, Neb., which includes five miles of double track and twenty motor cars, each motor car having two motors of 15 horse power each.

A Growing Telephone Exchange.—The manager of the Telephone Exchange in this city, Mr. Davis, has been kept busy for the past six months trying to accommodate his rapidly increasing list of subscribers, so that electrical work in all its branches has been abundant. G.

Kearney, Neb., June 6, 1889.

OUR TORONTO LETTER.

Introduction.—Electrical points are plentiful in the air up here. I send you a few just to remind your bright readers that this part of the world moves pretty nearly as fast as that portion of it south of parallel 45; in fact there are some strong grounds for the statement that this city of Toronto is moving in *a good many directions*, a little faster than any of your American cities. The point of this pun needs the explanation that we have so many men engaged in the real estate business here at present, and city property having got up about as high as it ought to go, they are surveying the country in all *directions*, and advertising "suburban lands" so vigorously, that if a tenth part of the outside property thus surveyed was added to the city, our area in real estate would be about equal to the city of Philadelphia.

Underground Wires.—Our city is developing so fast, that a number of our "City Fathers" have been exceedingly anxious for a few months past to immortalize themselves by crisp, vigorous legislation in the forcing of electrical, telephone, telegraph, messenger service, fire alarm, and other kindred wires underground. A bevy of them went off on a junketing tour, to a number of your American cities, but I fear they had too much fresh air, fresh oysters, or cold liquors or something else which interfered to some extent with their obtaining as much information as should have been gathered to provide a return for the funds expended, because since their return, the underground wire business has gone on in the Council in the same stupid way as it did before they left and, at present, it looks as if a few favored electrical companies would be permitted the privilege of tearing up our streets at their pleasure, while the telephone and the telegraph companies would be forced, at great inconvenience and loss, to get their wires stowed away under ground. Our Council do not seem to have as yet risen to a proper appreciation of the delicate subject they have undertaken to legislate upon, and, unless the present tactics and methods are changed, the electrical and other companies will be put to great expense, the citizens saddled with eternal confusion, arising from the tearing up continuously of their paved streets, and the whole thing have to be done over after a few years of exasperating experience.

The Fort Wayne Jenney Electric Company have opened an office in Toronto, for Canada, and there is very little doubt but that with so perfect a system of incandescent lighting and so able a representative in Canada as Mr. W. J. Morrison, who also represents them in New York State, they will soon have at least its full share of business in the Dominion. Mr. Morrison is assisted in the Canadian business by Mr. Thomas Cooper, of Toronto, who reports quite a number of sales in immediate prospect.

"SYNTAX."

PERSONAL.

President Q. A. Towne, of the Lynn Belt Street R.R., drove the first spike in the new road last week.

Mr. Arthur S. Williams, who is Mr. Farnham's assistant in the New England Telephone and Telegraph Company, was a New York visitor last week.

Even the intimate friends of Mr. A. F. Mason, manager of the Simplex Electric Company, have to look twice before feeling sure of themselves since he parted with his mustache.

Mr. Edward Sheldon, of the Fitchburg Steam Engine Company, is a New York visitor several days each week, looking after the business of his company at the New York office on Liberty street.

General Manager Pearson of the Consumers Gas Company, of Toronto, has written a letter to the *Globe* of that city defining his company's position in regard to entering the electric lighting business. Some opposition had been developed.

Mr. Louis W. Burnham, of the Electric Gas Lighting Company, has settled down quietly in Boston since his recent Western excursion, and is enjoying the fruits of that trip. Mr. Burnham will obtain distinction by the fact that he is probably not going to the Paris Exposition this summer.

The many friends of Mr. Willam H. Meadowcroft, now of the Edison United Manufacturing Company, will be pleased to learn that he will take a position with the Edison Lamp Company, at Harrison, N. J., within a few days. The small lamp business will be in the future conducted entirely by the lamp company.

Leonard & Izard have, after a hard fight, secured the contract for the Manitouwoc, Wis., central station plant, reaching three miles in one direction by one mile in the other. It will be a 2,000-light plant, for stores, residences, etc., also a street system of 32 candle-power incandescent lamps. They have also placed at Menominee, Mich., a 100-light machine with electrical accumulator batteries.

George W. Hunt, representing the Mutual Electric Manufacturing Company, of Brooklyn, Wednesday secured from Capt. Alfred H. Sweny a five years' lease of the three story brick building on Broadway, near the Port Schuyler bridge, West Troy, N. Y., in which to establish an electric light plant for the purpose of lighting the streets of the village, in accordance with the contract recently awarded by the trustees. The work of remodeling the building for the reception of the engines and dynamos is already begun, and will be rapidly pushed.

Mr. Henry A. Everett, of the East Cleveland Railroad Company, sends an interesting letter to the Cleveland *Leader*, ably defending the granting of further electric railway previleges in that city. In his letter he states that at a horse car speed of six miles per hour the East Cleveland Railroad company has completely broken down annually for the past few years from 150 to 200 horses, which horses were as good as the market afforded when bought, and which fact alone, from a humane point of view, should take every horse off from street cars within this year.

Kemmler's counsel is in the right. The law, foolishly suggested and urged by fur-capped Gerry, who generally succeed in putting his foot in it, says that executions must be by means of electricity. Electricians are ranged on either side of the various methods suggested. A higher and a broader law says that no cruel or unusual punishment shall be inflicted upon crimmals. This certainly would be an unusual punishment, and many fear it would be unnecessarily cruel. On the whole, it looks very much as though Brother Kemmler would not die on the day appointed. He certainly will not unless Governor Hill is convinced beyond all question that his death will be speedy as well as certain.—Joe. Howard, in the *Press*.

Telephonic News

⁂ The Salt Lake City Council has granted a petition for a new telephone line in the Mormon capital.

⁂ The Connecticut Legislature is considering an outrageous bill imposing a tax of 50 cents a mile on telegraph companies having more than two lines of wire and 25 cents a mile on all other telegraph companies; also imposing a tax of 70 cents on each telephone transmitter and a further tax of 20 cents on each mile of wire.

⁂ An ordinance authorizing the Director of Public Works of Philadelphia to construct subways and compel electrical companies to place their wires therein at an annual rental to that city was before the Electrical Committee of Councils on the 23d inst., and was referred back to Councils to be referred to the finance committee.

⁂ "Did I ever say all that?" he asked despondently as she replaced the phonograph on the corner of the mantle-piece. "You did." "And you can grind it out of that machine whenever you choose?" "Certainly." "And your father is a lawyer?" "Yes." "Mabel, when can I place the ring on your finger and call you my wife?"

⁂ With the consent of the pastor and deacons of the Congregational church at Tunbridge Wells, the South of England Telephone Company have been experimenting with their instruments, with a view to perfecting the transmission of a religious service to distant and scattered parts of the locality. This portends a revolution. For one thing, says our contemporary, *The Telephone*, those connected with the ecclesio-telephonic system could arrange the length of the sermon *à discretion*.

⁂ In reply to questions in the House of Commons recently, Mr. Goschen said, roughly speaking, the total cost of telegrams for the various departments of the Government during the year were something under £16,000. Last year votes showed that subsidies amounting to £49,000 net were paid by the Imperial Exchequer to submarine telegraph companies. He understood that the Eastern Extension Telegraph Company had laid two cables to Australia. The one which was first laid was unsubsidized, but the Australian Colonies paid an annual subsidy of £32,400 for the second.

⁂ The Société des Telephones has erected on the Champ de Mars, close to the Eiffel Tower, a pavilion, where its special apparatus will be exhibited. The ground has an area of about 3,000 square feet, and on this a building of 75 feet frontage has been constructed with two stories. On the first floor is an office with a telephonic installation on the multiple double-wire system, that is reserved for the use of subscribers to the telephonic service of the Exhibition, which is also connected with the whole of Paris. To the right and left of this bureau are rooms, one filled with the objects made by the company after its most modern practice, the other articles manufactured by MM. Rattier et Cie, and by MM. L. Weiller and Company. On the ground floor are fixed series of telephone receivers connected with the Grand Opera and the Opera Comique. The telephone exchange on the first floor is arranged for 800 subscribers, the charge to each being £12. The arrangements on the ground floor for the musical auditories are as follows: The two wings of the pavilion will contain four rooms, accommodating each 30 persons, the right wing communicating with the Grand Opera, the left with the Opera Comique. Each room will have 30 pairs of telephones, connected with six circuits. The price charged to visitors will be one franc for 10 minutes, and one room will be cleared while the audition is in progress in the adjoining room.

The Telephone Ear—It's the Left One.

You have a telephone ear.

You may not know it, but you have all the same.

It is the left ear, for it is on record that only a very small percentage of men or women use the right ear at the telephone. As a matter of fact the telephone has suddenly come into prominence as a medical proposition, and unless the scientists are mistaken the bulk of men and women who use the telephone, within a few years may expect to find themselves rather hard of hearing in the left ear. This is because when using the telephone every muscle and nerve of the ear is strained to catch the faintest sound from the person speaking at the other end. Dr. Oliver W. Moore, the eminent eye and ear specialist, was asked the other day if he had heard of any cases of deafness from the telephone.

"It is rather difficult to state exactly," he replied. "I have seen where the repeated sound of an instrument, or the repetition of any sound has caused deafness. Telegraph operators are in danger of injuring their sense of hearing. Boiler-makers often suffer from deafness. In the construction of boilers it is necessary for the man to be inside of the boiler and the other outside, and the incessant noise caused by the rivetting of the boiler always causes either deafness or an affection of the ear. As to the telephone it no doubt has the same effect. It is natural and reasonable to suppose that a person listening for a sound, and not knowing the exact moment when it will come may injure the membrane of the ear, and in time this might affect the hearing power."—*Albany Express.*

A Spider Web Telephone.

A gentleman was watching some spiders, when it occurred to him to try what effect the sound of a tuning-fork would have upon them. He suspected that they would take it for the buzzing of a fly.

He selected a large, ugly spider, that had been feasting on flies for two months. The spider was at one edge of its web. Sounding the fork, the man touched a thread at the other side, and watched the result. Mr. Spider had the buzzing sound conveyed to him over his telephone wires, but how was he to know on which particular wire it was traveling?

He ran to the center of the web very quickly, and felt all around until he touched the thread against the other end of which the fork was sounding; then, taking another thread along, just as a man would take an extra piece of rope, he ran out to the fork and sprang upon it.

Then he retreated a little way, and looked at the fork. He was puzzled. He had expected to find a buzzing fly. He got on the fork again, and danced with delight. Evidently the sound was music to him.

⁂ A telephone is like a human being in some respects. There are some of them that are always out of order and costing the company money, and some of them do not need attention once a year. Now and then a telephone needs repairing so much that the company actually loses money on it. I've known a telephone to get out of order mysteriously and defy all attempts to locate the trouble for a few days, and then in an equally puzzling way it would come out all right. We don't know half as much about electricity as we will after awhile, and there are many things about the telephone that we don't understand, but one or two simple lessons about it should be learned by every one. For instance, every user of a telephone should know that when he is listening and the voice at the other end of the line becomes now fainter and now more distinct, that induction from other wires is causing the interruption, and that the trouble will be only temporary. Hang up the audiphone, take it down in a minute and everything will work all right. But when there is a rattling in the 'phone, disturbing the sound, and sometimes cutting it off altogether, there is something wrong that needs the attention of an inspector.—*Telephone Inspector Frank J. McDonough, in the St. Louis Globe Democrat.*

The Strength of the Induced Current with a Magneto Telephone Transmitter as Influenced by the Strength of the Magnet.

"It is a well-known fact in practice as well as an evident consequence of theoretical considerations, that the effectiveness of a magneto telephone, when used either as a transmitter or as a receiver, varies with the strength of the magnetism of the core. But the relation of the one to the other has never been studied.

On the above subject, Prof. Cross states that his "investigations include a study of the changes in strength of the current produced by a magneto transmitter under varying conditions of magnetization, and of the magnitude of the momentary changes in the magnetic condition of the core of the receiving telephone when subjected to the action of undulatory or other brief currents, as influenced by the strength of the primitive permanent magnetization of the core. The present paper contains only the results of a series of experiments relating to the first of these, that is, to the effect of varying strength in the magnet of the transmitter, the study of the allied problems of the receiver being still in progress.

"The apparatus employed consisted of a cylindrical bar of soft iron about $4\frac{1}{2}$ inches in length and one-quarter of an inch in diameter, around one end of which was placed a coil of fine wire similar to that used in ordinary telephonic practice. The resistance of this coil was 100 ohms. It was placed in circuit with a ballistic mirror galvanometer, from whose deflection the momentary current produced in the coil by any variation in the strength of the core could be determined. The diaphragm, which was in all cases $2\frac{5}{8}$ inches in diameter, was in its usual place opposite the end of the magnet about which the wire coil was wound, and about $\frac{8}{100}$ of an inch from that end. By means of a rod carrying a cam moved by a weight, a rapid inward push of definite amount was given to the diaphragm, thereby inducing a current in the coil already referred to, and so deflecting the needle of the ballistic galvanometer. The soft iron bar was also surrounded by a second helix, through which was passed a current from a storage battery, serving to magnetize the core. A tangent galvanometer inserted in this circuit gave the strength of the magnetizing current. A magnetometer placed in the prolongation of the axis of the core, which last occupied an east and west position, made known the relative strengths of the field produced by the core under different conditions of magnetization.

"Corresponding observations of the magnetometer reading and of the current induced when the diaphragm was moved by the cam, were made throughout a widely varying range of strength of field, and the results were represented graphically by constructing a series of curves in which ordinates represent the relative strength of the field, and abscissæ the current due to a given predetermined throw of the diaphragm (about $\frac{1}{10}$ of an inch), as ascertained from the readings of the ballistic galvanometer."

⁂ F. H. Lamb, assistant superintendent of the Western Union Telegraph Company at San Francisco, has been in Portland, Ore., on official business, and will visit Puget Sound before returning. Talking with a reporter, Mr. Lamb said that the company is making preparations to rebuild its line to Astoria, and will begin work as soon as the water recedes. The new line will be built entirely on the Oregon shore, and will be completed this season. From Portland, it will be built along the Northern Pacific R. R. to Hunter's, and then follow the country roads and trails until it intersects the present line at Knappa. From there to Astoria, it will continue along the present route, except where a change would be for the better. The object is to get the line away from overflowed lands and out of the way of banks likely to be washed out by the river, so as to avoid interruption to communication. The present line, which was built in 1876 or 1877, runs from Portland to Vancouver, thence along the old road to Kalama, thence to Oak Point, where it crosses the Columbia river by cable to the Oregon shore

Electrical Development.

The Pittsburgh *Chronicle and Telegraph* publishes the following interesting editorial:

The introduction of electricity as a motive power and as a source of light has created an entirely new industry, the growth of which has been phenomenally rapid, but which must be dwarfed into comparative insignificance by its extensions in the future, not only in the lines already developed, but in the application of the subtle fluid to new uses in the service of mankind.

A gentleman who has been gathering statistics on the matter, states that at the beginning of the present year there were in operation in the United States no less than 53 electric railways, having an aggregate of about 300 miles of single track, and employing about 400 motor cars. About the same number of miles of track and electric motor cars were under process of construction, and the close of 1889 will probably find our electric railway industry more than doubled.

But the electric lighting industry is growing with much more remarkable rapidity than that just mentioned. Although in reality less than a decade in existence, it has grown to astonishing proportions, and may be summarized as follows: There are at present in the United States 6,000 central stations and isolated plants, using 245,000 arc lights and 2,700,000 incandescent lamps. To supply these with the light giving current requires steam engines of an aggregate horse power of 500,000. The 400 electric railways have a motor capacity of only 11,000 horsepower.

The average "life" of an incandescent lamp is six months, so that the 2,700,000 in use have to be renewed at least four times a year, giving a total annual consumption of about 11,000,000 lamps, to which add the precentage necessary to supply breakage and the whole number made will reach not much if any less than 12,500,000. The number in use is steadily increasing, and increasing very rapidly, too, so that it need not be surprising if in 1890 the total should be 5,000,000 or even greater. The manufacture of these lamps and electrical appliances and apparatus generally gives lucrative employment to a very large body of men, women, boys and girls, and is likely before many years to rank with any other in the people engaged in it and the wages paid.

Natural Electricity.

An extraordinary tale comes from Burmah. Mr. Ronald H. King, an electrician well known to the Burmese, while on a prospecting and shooting expedition in the island of Labuan, is said to have discovered a mineral from which electricity can be obtained without apparatus of any kind whatever. The mineral is described as being in the form of a black stone, of excessive hardness, and very great specific gravity, being nearly as heavy as platinum. A small block in the shape of an irregular cube, measuring 4.3 inches one way, by 5.2 inches the other way was brought away, and, on bringing it into the testing room, a strong effect was noticed upon the galvanometer. At first it was thought that the mineral was an ordinary loadstone, but on tests being made, it was found that the force was more akin to that of an electro-magnet, and that a strong current would flow when the mineral was connected in a circuit. Further tests revealed that a difference of potential of 47 volts could be detected at the extremities, the internal resistance of the mass being 20 ohms. The block appears to waste away very slightly, leaving a slight gray powder upon the surface when connected up for some time. The electrician now uses the block to light a couple of incandescent lamps in his laboratory!

⁂ Electric street cars at Bangor, Me., seem to have met with great favor. The system in use is the Thomson-Houston. Three electric cars have been running most successfully for the past two weeks, and the receipts have been more than $100 per day. The largest number of passengers accommodated by the electric cars in a single day was 2,700.

Lightning and the Electricity of the Atmosphere.

BY A. G. McADIE, M. A.

Lightning is essentially electricity of high potential. Potential is a convenient term to express a certain force relation. It is not electrical force. That arises when the potential of a body differs from that of another. When the potentials of bodies are the same there is no electrical force; furthermore, the direction of electrical force is always from the place of higher to the place of lower potential, and the rate of variation of the potential measures the component force in that direction. Franklin's famous kite experiment in reality only proved that a difference of potential did exist between the clouds and the ground. This, of all Franklin's experiments, is the most famous, because it was accepted at once as conclusively proving the general identity of lightning and the electricity developed by the friction machines of that time. But, we must not forget that other experiments were made by Franklin, and that the famous kite experiment was but one in a series.

The kite experiment, under modern auspices, was tried a few summers ago at the Blue Hill observatory, near Boston. The summit of the hill has an elevation of 635 feet above sea level, and is the highest point on this section of the Atlantic seaboard. We differed from Franklin in being able to ascertain the value of the potential at each step. Our first step was to ascertain the value of the potential of the air a few feet out from the observatory walls and about five feet above the ground. Then, having flown the kite (a large light silk-covered kite, the longest axis over four feet and tin foiled on the front face), the wired kite-string was connected with the electrometer and direct measurements of the potential made. The moment the kite-string, properly insulated, of course, was put in connection with the needle (a technical name for a light disk of aluminum which is free to move between two sets of metallic conductors which have different electrical potentials) of the electrometer, the needle was deflected with a considerable impulse beyond the scale limits, indicating a very high positive potential for the air in the vicinity of the kite. All of one forenoon the sky was covered with a low pallium of dark stratus clouds and the weather threatening, and yet the deflections were just the same as later on, when the weather had cleared up and developed into a clear and pleasant June afternoon. On one morning the wind was quite "puffy," and consequently our kite, after we had succeeded in flying it, was not at all steady, and kept falling and rising. Without exception, when the kite would rise, the needle would indicate an increase in the value of the potential, and the sparks would be longer and more frequent, while on the other hand, as regularly as the kite fell, the deflection decreased. At another time we made experiments when the sky was without clouds and with the kite about 400 feet above the ground, the sparks we obtained on "grounding" the kite wire were thick and in length about one-eighth of an inch; these under a perfectly cloudless sky.

It is a surprising fact that, with the great number of experiments that were made by the large number of able workers contemporaneous with Franklin, no very marked advance upon his experiments occurred during the 40 years succeeding, and it was not until the beginning of the nineteenth century that attempts at systematic observations of atmospheric electricity and weather elements were made.

Perhaps the most interesting observations on the character of lightning were some made at the top of the Washington monument, elevation 500 feet above the city streets, during thunder-storms. On July 14, 1886, a thunder-squall came up suddenly. Negative deflections indicated a potential difference between the air at the monument and the ground of 3,000 volts, or, in other words, there was the same difference as between the first positive and final negative pole of 3,000 Daniel cells connected in "series." Sparks passed almost continuously between the suspending wire and the case of the electrometer. The "sparking" between the collector and ground ceased, and, as we afterwards found out, when thunder clouds approach the electrometer needle responds to their presence and is very active, and after considerable oscillation begins to move steadily in one direction as if subject to a steadily increasing pull, and then, when perhaps a potential of several thousand volts is reached, a sudden drop to zero occurs, and with it the flash of lightning. Then the needle begins again to move steadily, and repeats the same operation with every flash of lightning. And it is both possible and not difficult, in this way, to know just when a flash of lightning is going to occur, and to prepare the camera (if we are taking photographs). This at least is one feature, we think entirely new and brought out by these experiments and observations.

It is a common experience with surveying parties, especially on western mountain peaks, to undergo peculiar sensations during thunder storms. These effects consist in general of a hissing, crackling sound, accompanying single discharges, or more marked sparks, with a tingling sensation if a finger be presented to any metallic object near by. Now it has been several times observed that a sudden cessation of these distressing electrical effects was experienced whenever there occurred a flash of lightning. We see an explanation for this in what precedes, and our electrometer measurements prove to us without doubt that every lightning flash relieves the electrical tension, besides enabling us to measure the electric strength of the air under ordinary conditions, and the electro-motive force producing the disruptive discharge.

Finally we come to the effects of the electrification of the air upon water, dust and other particles in it. Whenever our collector was "grounded," the fine stream of water issuing from it would preserve a certain even, rounded character, breaking into drops some four inches away from the place of exit. Removing the "ground" connection, and the stream being now under the influence of the thunder-clouds, the steadily increasing electrification of the air caused the stream to twist and split with innumerable threads and sprays; but with the flash of lightning the distortion ceased to exist, and the stream resumed its first and proper character, only to be again distorted and to repeat the operation with each flash of lightning. Here is a cheap and easy mode of foretelling the lightning, and the photographer has now at his hand warning for his exposure.

The Halifax Carnival.

The *Evening Gazette*, of St. John, N. B., has the following remarks to make concerning the rival exhibition and carnival under way at Halifax, N. S.:

Halifax as usual tries to follow St. John but gets left. Some time since we published a letter from the secretary of the Halifax carnival committee, asking for particulars as to the electric exhibition, in order that they might arrange for its transfer to Halifax. The secretary of the St. John carnival replied showing that the arrangements could not be completed at this late date. The Halifax secretary replied as follows:

HALIFAX, N. S., May 27th.

IRA CORNWALL, Esq.,
Secretary Board of Trade,
St. John, N. B.

Dear Sir—I am in receipt of your esteemed favor of the 25th inst., and in reply have to thank you for the information in reply to my enquiry regarding the "Electric Exhibition." The committee when ordering me to make the enquiry were not aware that the affair was a local matter, and I am sure will regret being unable to add to it our other attractions.

I am Sir, Yours truly,
W. C. BISHOP, Sec'y.

And yet we find that Halifax continues to advertise the electric exhibition as one of its leading attractions. The Halifax carnival programme consists of naval and military parades, without any original feature to stamp it as a carnival. Let them stick to the truth in their advertisements as St. John does.

.... At the annual meeting of the International Telegraph Company, at the office of Brown & Josselyn, in Portland, Me., Tuesday, the following officers were chosen: President, H. M. Hart; treasurer and clerk, A. D. Brown; directors: Justin Andrews, of Boston, S. D. Bailey, of Bath, and A. D. Brown, H. M. Hart, C. C. Bedlow, T. A. Josselyn and George E. Smith, of Portland.

.... W. E. Lewis has gone into office as the superintendent of telegraph of the Long Island Railroad. Mr. Lewis formerly held that position, but resigned eight years ago to accept a situation as superintendent of the Ohio road. From there he went to Mexico as general superintendent of a road. For the past two years he has held a responsible position for the Baltimore and Ohio road. When Mr. Lewis resigned from the Long Island road before, C. E. Topping, the general manager of the Long Island Express, took charge of the telegraph as well. Upon Mr. Topping resigning to accept the position of general superintendent of the United States Express Company, the departments were separated again. Mr. Lewis proved his efficiency before, so that there can be no possible doubt about the department being conducted in the best manner possible.

.... In the days that are gone, far back in the infancy of telegraphy, a director of the Bain line, at Troy, N. Y., once asked the operator, "What is electricity?" and the callous youth remarked that, "What it is was far more difficult to state than where it is," adding at the same time and pointing to a cracker which the director was munching, "even in that cracker there is electricity." It was an unfortunate statement, in two ways, for it damaged the estimation in which the operator had hitherto been held by his superior, and it spoiled the director's lunch. And now, over forty years after, were that director alive, he should apologize to the gray-haired representative of that unwise electrical youth, for are they not at this moment using electricity in place of yeast and pommeling, to produce finer bread in London and Glasgow, and have been for a twelve month? Well, any one who has eaten a hotel breakfast on Sabbath morning, within sight or sound of Bow Bells, knows full well there was need of improvement in London's bread. But the telegraph director, alas! has gone, and will never, more's the pity, know that there may be electricity in bread.

.... Superintendent William B. Gill, of the Western Union Telegraph Company, Philadelphia, was a busy man during the week or ten days after the Johnstown disaster. What sleep he obtained he caught at odd intervals on the sofa in his office to the music of the clicking of the telegraph keys. Mr. Gill from his office in Philadelphia directed the work of restoring telegraph communication. In speaking of his work Mr. Gill said:

"As rapidly as we could procure by telegraph the names of the passengers locked up at Altoona, with their addresses we have sent a message to the address of each one, free, notifying their family of the safety of the passenger and where located. There are 500 passengers locked up at Altoona. Wherever we have opened up communication the first thought has been to turn it over to the railroad companies, believing that there is no avenue for relieving the public as broad as that through the railroad companies. The nature of the disaster was so interwoven with the railroad companies interests that a relief to them is a relief to the public exigencies.

"We have thrown the wires open to the public for the relief of the sufferers at Johnstown and other points. We have been in communication with General Hastings, who has cheerfully aided us in furnishing the information to the relatives and friends of the suffers at Johnstown."

A Head Swelling; Our mayor appears to be afflicted with pole evil—H. D. L.

—— Electric lights, equivalent in illuminating power to 1,700,000 candles are used in lighting the Paris exhibition.

TELEGRAPHIC

.... The Knoxville, Cumberland Gap and Louisville Railroad Company will build a telegraph line along their road from Knoxville to Cumberland Gap and Middlesborough, Ky.

.... The total length of the submarine cables at present in use is said to 113,031 miles. Of this length, 102,531 miles belong to various cable companies, and 10,500 miles are government property.

... Mr. J. B. Stewart was recently appointed Superintendent of Telegraph and Signals of the West Shore, New Jersey Junction, Wallkill Valley, and Syracuse, Ontario and New York roads, in place of G. S. Bogert, resigned.

... The whole corps of Western Union telegraph operators at Johnstown, Pa., was lost Friday evening. Among them were Mrs. Ogle, manager, who, for 25 years, has acted as receiver of Associated Press reports at that place, and her daughter Minnie, also well-known; also Misses Gorman and Watkins and three messenger boys, who were unable to escape from the building.

.... The almost superhuman work done by the Western Union operators in Pittsburgh, while the news of the flood came pouring into the city from all quarters of the panic stricken district, completely wore them out, and relief operators were telegraphed for from Cleveland, Oil City and other points. In the meantime all the ex-operators and anyone who could send or receive a dot or dash were impressed into the service.

.... Mr. Campbell Swinton, of England, has recently constructed a magneto Morse sounder, on the principle of his well known magneto bell. The play of the transmitting lever is made less, and the bell hammer is made to hit against two buffers, arranged to give different notes when struck. The absence of battery will make the magneto sounder exceedingly useful for field telegraphing, and the instrument has been sent to the English war department at Chatham to be tested.

.... Mrs. Ogle, the manager of the Western Union office at Johnstown, Penn., who died at her post, will go down in history as a heroine of the highest order. Notwithstanding the repeated notifications which she received to get out of reach of the approaching danger, she stood by the instruments with unflinching loyalty and undaunted courage, sending words of warning to those in danger in the valley below. When every station in the path of the coming torrent had been warned she wired her companion at South Fork, "This is my last message," and as such it shall always be remembered as her last words on earth, for at that very moment the torrent engulfed her and bore her from her post on earth to her post of honor in the great beyond.

.... The case of the Interstate Telegraph Company against the Baltimore and Ohio Telegraph Company for breach of contract which had been on trial in the United States Circuit Court, was concluded Saturday. The jury rendered a verdict for the plaintiff for $35,000. The amount sued for was $50,000. The case grew out of the failure of the Baltimore and Ohio Telegraph Company to make provision in case it sold its franchises to protect the Interstate in certain lines the latter had constructed in Indiana and Michigan, or to reimburse the company if that part of the contract was not fulfilled. Morrison & Bond, of Baltimore, and Griffin & Warren, of Detroit, Mich., represented the plaintiffs, and Charles J. M. Gwinn, of Baltimore, and Rush Taggart, of New York, the defendants.

* * The Salem and Peabody electric elevated railway bill has been referred to the next Massachusetts legislature.

* * The Pittsfield (Mass.) street railway managers are considering the feasibility of using electricity as a motive power.

* * The probabilities are that the Edgewood avenue electric road in Atlanta, Ga., will be in operation in about one week

* * The Buffalo electric road between Cold Spring and the Park is prevented from starting by the non-arrival of the car trucks. Everything will be running by June 20, according to Mr. Henry M. Watson, the president of the Buffalo Street Railway Company.

* * The New England business of the Sprague Electric Railway and Motor Company, of New York, will hereafter be conducted by the New England Electric Company, with offices at 55 Oliver street, Boston. Mr. F. J. Sawyer is president of the new company, and Mr. Edward Blake, treasurer.

* * The Oakland Trustees have directed the Board of Public Works to prepare plans and specifications for a plant of poles and wires for the city, to be owned by the city, in order that Oakland might invite bids from everybody for lighting the city by electricity. The idea is for the city to own the poles and wires, and the company the plant.

* * A mass meeting of residents of the East End, Cleveland, O., was held at Doan's armory last week for the purpose of making an emphatic protest against the action of the Prospect street people, who are endeavoring to prevent rapid electrical transit west of Willson avenue. The call for the meeting is signed by many of the best citizens of Cleveland, and the meeting cannot help but be a rousing one. There will be good speaking, and some action will be taken so that the rapid transit desired may be secured at once.

* * The Thomson-Houston Electric Company has recently closed the following contracts for electrical street car propulsion: Fulton County Street Railway Company, eight miles, eight cars; Attleboro, North Attleboro and Wrentham Street Railway Company, Attleboro, Mass., six miles, five cars; Americus Street Railway Company, Americus, Ga., four cars; Auburn Street Railway Company, Auburn, N. Y., three cars. The Thomson-Houston Electric Company has 50 railways under contract and in operation.

* * A franchise was granted last week by the county court in session at Independence, Mo., to the Kansas City suburban railway company to build and operate an electric line on Troost avenue, from the present terminus at Troost and Thirty-second streets to a half mile south of Forest Hill cemetery. Work on the road must begin within 60 days, and the road must be in operation within 60 days. The line will be four miles in length and will pass through some of the finest suburban territory about Kansas City. It will give rapid transit in a direction where the same has been needed.

* * Builders have handed in their figures for the contract in the erection of the brick factory on the west side of Fedral street, Lynn, Mass., by the Thomson Electric Welding Company. The proposed building will reach from the present factory to the street line, and will be of much greater elevation than the first one. The increase of business has made it imperative for the speedy erection of the factory; and the indications are that this enlargement of the works is but the beginning of a movement that will lead to as phenominal a growth of the welding works as has been the case with the motor works.

* * The employés of the Edison Machine Works responded liberally to a call for aid for the Johnstown sufferers. The Edison Machine Works headed the list with a contribution of $250. Then followed Samuel Insull, $100; John Kruesi, $60; Wm. B. Turner, $40; W. A. Phillips, $40; H. A. Libor, $25; Thomas Gunn, $20; W. E. Gilmore, $15; Montgomery Waddell, $15; Walter S. Van Vorst, $10, and the following, who gave $5 each: E. J. Berggren, Joseph Insull, L. O. Weber, A. V. D. Linde, H. F. Parshall, David O. Youlan, R. G. Brooke, Frederick Hoeppner, Adam Smith, W. Geo. Rothwell, Chas. W. Jefferson and George Tailleur. Many other contributions of smaller sums, from 25 cents to $3 each, swelled the amount up to $801.75.

* * From the Cleveland *Leader*: "With one company already running its cars by electricity, another using the same motive force over part of its line and anxious to extend it over the whole line, with a third about to try the experiment of using storage batteries, and a fourth making preparations to put in a cable road, Cleveland can truthfully be said to be getting rapid transit as expeditiously as any other city in the country. Unless present plans miscarry, there will be rapid transit over every one of the principal street car lines in the city within two years. This is progress. And it is just this kind of interprise that makes the future growth of the city certain to be rapid, continuous and eminently healthy."

* * The Auburn, N. Y., *Advertiser* says editorially: "Already a representative is here asking for a franchise for an electric road. We hope he will get it without any trouble at all. There ought to be no "sweating" or trouble of any kind. Let us just give this right of way immediately, and not stand around like dogs in a manger preventing it. The island has been in the lake for years, the chance to build a railway has been animadverted upon by us for years. No one has seen fit to improve the one or build the other. Now that strangers have come asking to do so, we say Yes! Give them the right of way at once and put no trouble in their way, but bid them God speed and as much success as man can desire. Go it!"

Municipal Lighting.

The following from the Boston *Globe*, in regard to the discussion in the Massachusetts legislature on the bill to permit Danvers, Mass., to sell light to its citizens, is of interest:

"The bill to allow the town of Danvers to provide its inhabitants with electricity has been unanimously reported by the committee on manufactures, but Chairman Palmer stated that he had reserved the right to oppose the bill. He thought that the principle involved in the bill was wrong, and that the investigations of the committee in Wheeling, Richmond and Philadelphia, showed that the business was not a proper one for towns and cities to go into.

"Senator Gleason opposed the bill as a step toward communism and away from competition; competition was the life of trade.

"For the committee and in behalf of the town Senator Walker said that the town had already bought an electric light plant to light its own streets; the service is satisfactory and cheap. Another company could not be established, for there is not business enough outside of the town lighting for another company; it is therefore impossible for private parties to obtain electricity, and so the town has asked that it might furnish it to its citizens. The additional expense to the town would not be more than $5,000, and the town is almost unanimous in favor of the bill.

"That the people of Danvers may want to go into this business was admitted by Senator Crosby, but he thought that other considerations ought to be taken into account. If Danvers ought to be given the power, it would be all right for every other city and town to do the same thing. Unless it could be shown that Danvers was peculiarly situated, special privileges ought not to be given. The legislature had already defeated a measure to give this right to all cities and towns and this special privilege could not logically be granted. He was opposed to the bill, also, on the ground that it was unconstitutional, because it would give privileges that cannot be legally granted to towns.

"This latter view was also taken by Senator Sprague.

"The bill was defeated by an overwhelming vote; no count was taken."

President Q. A. Towne, of the Lynn Belt Street R. R., drove the first spike in the new road last week.

The Pelton Water Wheel.

To the Editor of Electrical Review:

Your article relating to the electric transmission of power on the Comstock in issue of May 25th, does us unintentionally, no doubt, great injustice.

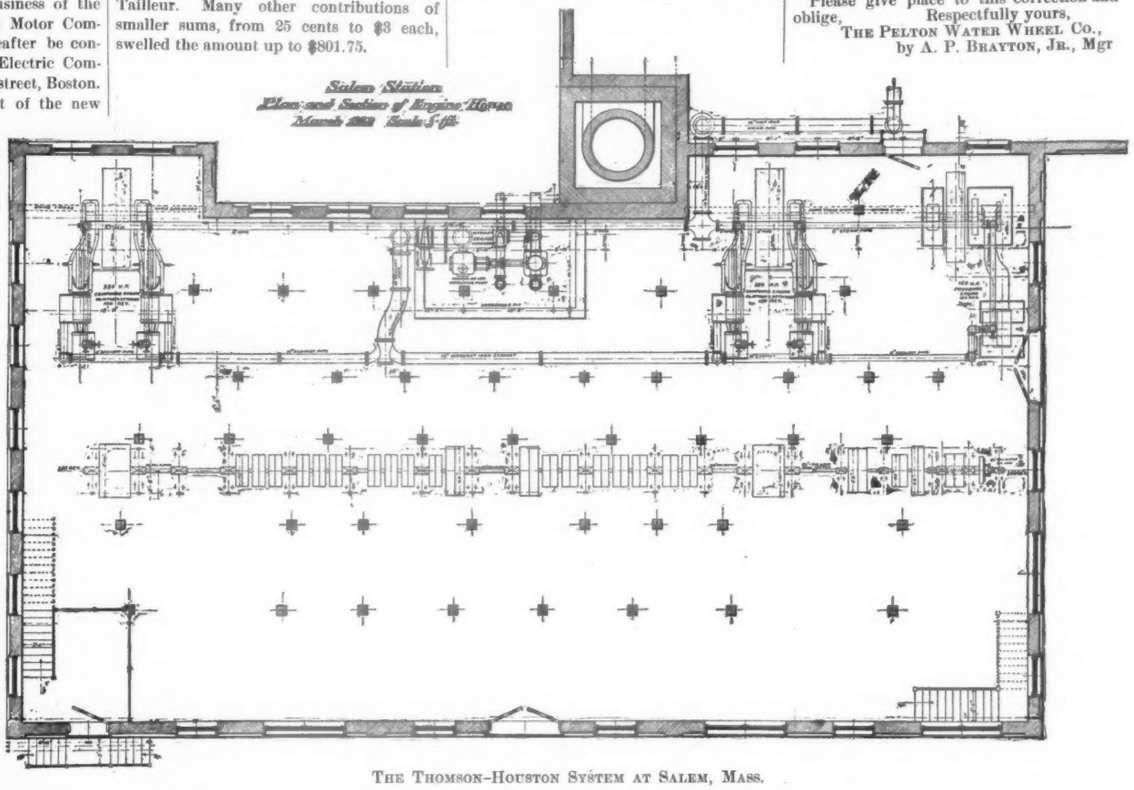
The statement is made that the Brush Co. in its original plans and specifications stipulated that the water wheels should be governed within reasonable limit, but that this requirement was not met, "the Brush Co. having been surprised to receive by telegraph the first intimation that the makers of the water wheels had wholly neglected such an important matter," etc.

The facts in regard to the above being that no request was made for governors, it being understood that the parties having the contract for the plant would provide them. It was therefore an oversight or misunderstanding, which we are in no way responsible for.

There is no difficulty in governing our wheels, even under the extraordinary conditions these wheels were operated, and we certainly should have made proper provision in this regard had we been called upon so to do.

Please give place to this correction and oblige,

Respectfully yours,
The Pelton Water Wheel Co.,
by A. P. Brayton, Jr., Mgr



The Thomson-Houston System at Salem, Mass.

Auxiliary Accumulator Cars.

In the case of a tramway proposing to run accumulator cars, but where there is one steep gradient on a long level run, it has been proposed to use an auxiliary electric engine to help the cars up the steep part, as is now the practice with horses. The disadvantages of having very large motors on each car would be obviated. Arrangements for altering the ratio of speed and power by gearing are likely to be far more useful in ordinary cases, but it is possible that circumstances might arise when the adoption of this suggestion would solve a difficulty, and prove more economical, both in maintenance and first cost, than by the adoption of more costly gearing for each car. The passenger cars could then be fitted with light batteries sufficient for ordinary running, and the auxiliary engine would be stationed at the steep part, and be kept working there during the whole day. The saving in outlay for batteries and for gearing might be far more than the cost of the auxiliary engine in a system requiring a large number of cars.

So rapid has been the development of the electric industry, few have been able to keep trace of its achievements, and fewer still have sounded its possibilities for the purpose of giving distinction to its growth.

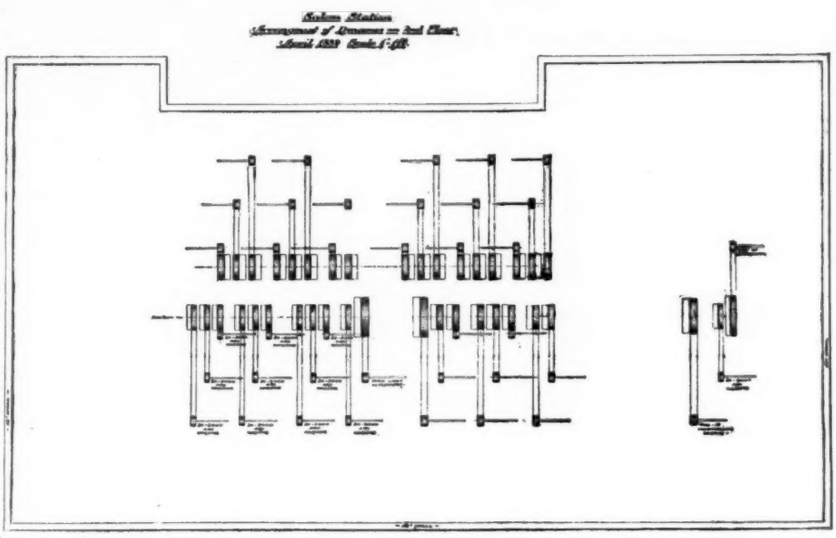
New Central Station, Salem, Mass.

The Salem Electric Light Company, finding its present station entirely inadequate to the needs of its rapidly increasing business, is now erecting a new one, designed by the Thomson-Houston Electric Company.

The new station will be a model of its kind, and in its construction are combined many new features and improvements in central station work.

The accompanying illustrations show in detail the method of construction of station, and the location of the steam plant and electrical apparatus. Owing to the shape of the lot of land owned by the company, it was deemed expedient to erect two buildings. The boiler house, therefore, has been made independent of the building containing the engines and dynamos.

The engine and dynamo house is two stories high, the first story, where the engines are situated, being 14 feet, and the second, where the electrical apparatus is placed, being 12 feet. This building is built of brick throughout, and is 102 feet long and 56 feet wide. The boiler house is 92 feet long, 54 feet 4 inches wide, and 23 feet high. The chimney is 130 feet high, 6 feet diameter inside, and 13 feet square at the base. The foundations are rubble stone placed on piling capped with concrete. Seven hundred and ninety-eight spruce piles were used under the main building, and 52 oak piles under the chimney.



The steam plant, which is compound condensing, consists of one 350 horse-power double tandem compound engine, made by McIntosh & Seymour, and one 150 horse-power high pressure Fitchburg now in use in the present station.

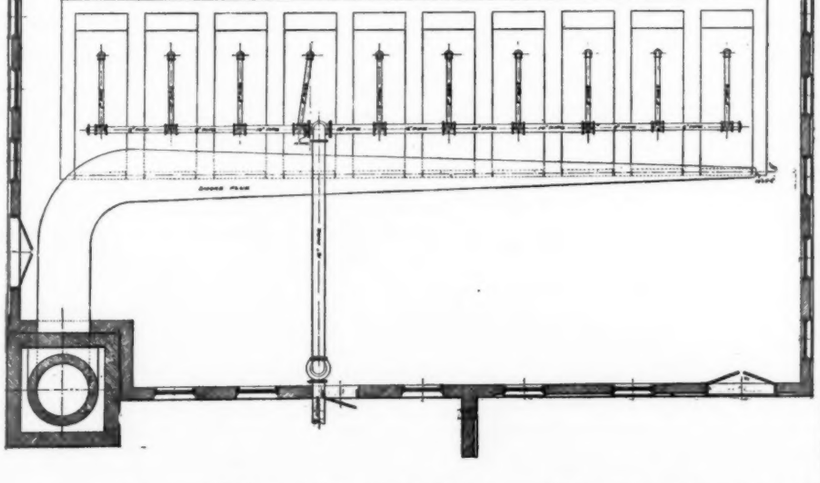
The boilers were made by the Cunningham Iron Works and are three in number, six feet in diameter, 17 feet long, and 125 horse power capacity each.

The auxiliary steam apparatus consists of one 1,200 horse-power surface condenser, Knowles air and circulating pump, and a feed water heater situated in the smoke flue.

The station is built to allow the addition of 1,000 horse power, and there is room for nine additional boilers and another line of shafting. The station has a capacity for 42 dynamos. At present there will be 14 in use, 11 arc and two alternating current machines, and one generator for railway work. On the second floor are the store and testing rooms and the superintendent's office.

A coal shed will be built in the rear of the boiler house which will have a capacity of 1,500 tons, and a track constructed for bringing coal from the shed to the boilers.

No pains will be spared to make this station, even to the smallest detail, a model of its kind, and it will be one of the finest electric light and power stations in the New England states.



—— Auburn, N. Y., has just made new electric lighting contracts, increasing the number of street lights.

—— The building and plant for the Missouri Electric Light Company, Twentieth and Locust streets, St. Louis, are almost completed, and the machinery has already begun to arrive.

—— The contract for lighting the village of Newark, N. Y., was let at the last board meeting of trustees to the Newark Electric Light and Power Company of Newark. They are to furnish forty 2,000 candle power arc lights to burn 26 nights in the month from sundown to 1 o'clock A. M. The contract to is run for five years, and the village is to pay $2,400 a year.

—— The Perkins Lamp Company, of Manchester, Conn., are turning out about 600 incandescent lamps daily, and are rapidly increasing their facilities. They have orders for several months ahead.

—— All the electric lights in the city of Chattanooga, Tenn., including the street lights, went out Monday night with a sudden spasm, and never showed up again during the night. It wasn't the fault of the electric light company, however. The water company failed to get the water over the hill to the plant, and the engines were compelled to shut down.

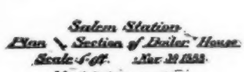
—— The Neponset, Mass., Electric Light Company is desirous of lighting Canton and several hearings on the subject have taken place.

—— The Fort Wayne Jenney Electric Light Company, through its representatives, the Commercial Electric Company, of Detroit, has sold to the Decatur, Ill., Electric Railway Company, a 600-light plant of the Slattery Induction System, to be operated in connection with their railroad plant for commercial lighting.

—— The Baton Rouge Electric Light and Power Company will add machinery for incandescent lighting.

—— All the electric lighting machinery, and the facilities for illumination by gas having been destroyed in Johnstown, the Allegheny County Electric Light Company gave relief of an important kind. A plant capable of generating electricity for 12 arc lamps were shipped to the stricken city. It was accompanied by the necessary wires and lamps. The plant could be set up anywhere, and the lights placed where they were most needed.

—— The Schuyler Electric Company of Middletown, Conn., have put in a temporary lighting plant to facilitate construction work on the new Plaza Hotel, 57th street and Eighth avenue, New York. The plant consists of two 40-light (1,200 candle power) machines, and was installed by the Tucker Electrical Construction Company.



—— The annual meeting of the stockholders of the Nashua Electric Light Company has been held, and the following board of directors elected: J. W. White, Chas. Williams, H. W. Gilman, Jas. H. Tolles, F. E. Anderson, G. A. Rollins, D. A. Gregg, F. W. Estabrook, W. A. Lovering. The board organized as follows: J. W. White, president; Chas. Williams, vice-president; James H. Tolles, secretary; F. W. Estabrook, treasurer; James H. Tolles, clerk of the corporation.

ELECTRIC LIGHT NEWS

—— Buffalo, N. Y., has appointed a committee to look into municipal lighting.

—— Slater, Mo., has decided against buying its own plant, prefering to rent of the company.

—— The Brush Electric Light Company has received a contract to light the city of Griffin, Ga.

—— The Taunton (Mass.) Electric Light Company is said to have declared a dividend of six per cent.

—— The Tombigbee Cotton Mills, of Columbus, Miss., will want machinery for incandescent lighting.

—— The bill to allow Danvers, Mass., to provide its inhabitants with the electric light was refused a third reading by the Massachusetts Senate.

—— All Russian ships of war are to be lighted exclusively by electricity, and by January next the whole of the Russian fleet will be lighted.

—— The new plant at Medina, N. Y., is being put in and Medinaites will see electric illumination in their own town by the middle of the month.

—— The Columbia, S. C., Electric Light Company is erecting a plant with a capacity of fifty 2,000 candle-power arc and 600 incandescent lights.

—— The Hill City Electric Light Company at Vicksburg, Miss., are contemplating adding an incandescent plant for the purpose of lighting private houses.

—— The Louisville, Ky., Bagging Manufacturing Company have contracted with the Brush Electric Company, of Cleveland, Ohio, for an electric light plant.

—— Windsor Locks, Conn., is the latest scene of action for the representatives of the various electric light companies. A new plant will be put in there soon.

—— The Louisville and Madison Woolen Mills Company have contracted with the Brush Electric Company of Cleveland, O., for a 600-light incandescent plant.

—— The Sterling, Ill., city council has awarded the city lighting contract to the gas company who will furnish 180 incandescent electric lights using the Westinghouse alternating system.

—— The Providence *Telegram* prints an interesting description of the new electric light and power station of the Narragansett Electric Light Company in that city. When it is completed the Narragansett Company will have, it is claimed, the largest and best equipped establishment in the world.

—— The Brush Electric Light Company, of Baltimore, J. Frank Morrison, managing director, Monday filed a bond for the proper execution of the contract awarded to them for the electric lighting of the city. The certified check for $5,000, which had been left as a guarantee, was thereupon withdrawn.

—— Following is the record of incandescent lamps in plant of the Mather Electric Company, at the paper mill of the Forest Paper Company: Total number of lamps in use, 290; still in use, 85; 13 lamps having burned less than 600 hours; 40, from 600 to 1,000; 91, 1,000 to 1,500; 14, 1,500 to 2,000; 20, 2,000 to 2,500; 5, 2,500 to 3,000; 4, 3,000 to 3,500; 4, 3,500 to 4,000; 4, 4,000 to 4,500; 2, 4,500 to 5,000; 4, 5,000 to 5,500; 1, 6,500 to 7,000; 1, 8,000 to 8,500; 4, 9,500 to 10,000; 1, over 10,000. Of the 85 lamps still in use the record is as follows: 16 have not yet burned 600 hours; 3, are still burning, having already burned over 600 hours; 8, 1,500; 5, 2,000; 14, 3,000; 2, 3,500; 32, 5,000; 4, 9,500; 1, 10,000.

MANUFACTURING NOTES.

The R. T. White Street Railway Rail will be handled in St. Louis, Mo., by T. C. White, agent of the Fulton Foundry, of Cleveland. From his Boston office Mr. White is sending out a large number of sample chairs and sections of rail.

The Celebrated P. & B. Paint is used on all of the 150,000 feet of underground cable now being laid in New York. The Standard Paint Company, who own all the P. & B. electrical compounds, are showing some fine specimens of P. & B insulated wires at their New York office on Maiden Lane.

The Electrical Supply Company, of Chicago, are exclusive western agents for the Cobb vulcanite wires and cables, and have issued a small pamphlet giving some facts and figures concerning the Cobb products which are of interest, including a number of commendatory letters from such men as Carl Henry, Edwin J. Houston, J. F. Mehren and J. P. Barrett.

The National Galvanic Battery Company, of 18 Courtlandt street, N. Y., are meeting with much success with their improved form of battery, for open circuit work. The Union Switch and Signal Company, in a report on the battery, compare it favorably with the "Samson," and letters from the N. Y. C. & H. R. R. R. Company are also highly commendatory. The factory of the National Battery Company is in Cincinnati, Ohio, at 239-241 Main street.

The Westinghouse Machine Company, of Pittsburgh, Pa., is fitting up a new machine shop for large work on the east side of Twenty-fifth street and Liberty avenue. A very large new planer, by William Sellers & Co., is already erected and in operation, and a large new cylinder boring machine, of special design, by the Pond Machine Tool Company, is now in process of construction, with the delivery promised for June 1. Other large tools will be added. The new shop is rendered necessary by the company's heavy run of orders for large compound engines. Among recent shipments are large automatic compound engines for new incandescent lighting plants at Tarzuela, the largest theatre in Madrid, Spain, and for the Spanish American Light and Power Company, of Havana, Cuba.

Leonard & Izard have just secured an order for installing 5,000 16 c. p. lamps in the works of the Elgin Watch Co. This is one of the largest isolated plants in the world in a factory building, with the exception of the Chicago Auditorium plant also installed by Leonard & Izard. The competition on this job was very sharp. Leonard & Izard bid upon a first class plant, to give certain results under strong guarantees, not confining themselves to any particular make of apparatus. Purchasers of electrical plants seem to be very much inclined to deal with a reputable and non-partisan electrical engineering concern, as in this case leaving in a large measure the selection of the apparatus to be used to them, and securing not only the guarantees of the contractors, but also the guarantees of the makers of the apparatus used.

.... Telegraph poles are said to be preserved in Norway by making an auger hole about two feet from the ground, in which four or five ounces of sulphate of copper in coarse crystals are placed and plugged in. The chemical is gradually absorbed by the wood until its whole outer surface turns a greenish hue. The sulphate requires an occassional renewal and is said to be a perfect preservative.

Secondary Batteries.

BY WILLIAM HENRY PREECE, F. R. S.

CENTRAL STATIONS.

The secondary battery lends itself admirably, under certain circumstances, to the economical distribution of electric currents from central stations. It is possible to lay down a long main circuit of small dimensions, conveying a direct current of high E. M. F., which at different points can charge a secondary battery of a small number of cells, so as to "transform" the dangerously high E. M. F. into one of a low and harmless character in the building to be illuminated. In fact, this is now being done in Chelsea by two different companies. The one company, the Chelsea Electricity Supply Company, is acting under the statutory powers of a provisional order, and it distributes its currents to the houses from substations where the batteries are kept, and maintain a continuous supply of electric energy. Each sub-station, of which there are three, supplies current for 2,000 30-watt ten candle-power lamps. There are 265 31-L cells, divided in two sets of groups of 53. Each set is charged separately and alternately in series from the central generating station. While one set is being charged the other is supplying currents to the consumer. The main charging current of 60 amperes has an E. M. F. of 500 volts per distributing station, or 1,500 volts for the present circuit; and the secondary discharging supply into the houses has a pressure of 100 volts. This system of distributing currents from batteries has many advantages. The currents, being direct, are available at once for motor purposes as well as for lighting. The currents being so steady and uniform, add to the durability and life of the lamps. The supply being continuous day and night, it is always available, just as is the light from gas. The distributed currents being of low E. M. F., absolute safety to person is secured in such a system. The engines at the central station being always worked at full loads, can be worked under their most economical conditions; and as they can be worked continuously throughout the 24 hours, a minimum capital expenditure in engine plant is necessary. It has already been pointed out that the efficiency of the battery is not much effected by variations of its own load, and that whether one lamp or 100 lamps be used it is of not much consequence to the cells; in fact the efficiency of the lighter load is the highest. On the other hand, it must be pointed out that there is a considerable capital outlay required in batteries. The depreciation of the cells is very considerable, and there is an appreciable loss of energy at each transforming point. The maximum efficiency of batteries in practice rarely reaches 70 per cent., while less than 15 per cent. for depreciation can scarcely be allowed with prudence. The batteries for 1,000 lamps cost £1,325, or 27*s.* per lamp. The reliability, constancy, and permanence of the light from batteries compensates for many another evil. The other company in Chelsea—the Cadogan Electric Supply Company—places the batteries in the houses, and charges 1,000 E. P. S. 31 L cells over a circuit of nine miles.

There is a central station in Detroit, in the U. S. A., also distributing by batteries, and giving great satisfaction.

The Kensington Court central station, established by Messrs. Crompton & Co., and that at Whitehall Court, also use secondary batteries, but the batteries are in the stations, and not in the houses. They are used more for regulation and for reserve force purposes than for distribution.

There is a large central station at Vienna, and one at Darmstadt of the same character.

An extremely ingenious mode of distribution has been proposed by Mr. Henry Edmunds. The battery is divided into four groups. These groups are jointed in series, and supply energy to the house, while the fourth group is in the main being charged. These groups constantly and continuously changed places every three minutes by means of an automatic switch. A third of the battery is, therefore, always being charged, and this means that only one-third engine-power is needed at the central station, and only one-third of the E.M.F. on the changing main. Mr. Edmund's automatic distributor is an extremely ingenious apparatus, but it has not yet received the test of practical trial, though the sooner it does so the better.

TRACTION.

A very important application of secondary batteries is that of traction. In the United States this system has received immense development, but in England it has scarcely as yet grown out of the experimental stage. In London the North Metropolitan tramways are trying some important experiments, but in Birmingham an electric locomotive has been made by Elwell-Parker on the Julien principle, weighing eight and one-half tons, and worked by 100 cells, each weighing 81 pounds, which has drawn loads of 30 tons up stiff gradients, and has run 70 miles with only one charge. This system is destined to be most useful and economical, and it looks as though it would gradually replace horses for tram work.

PORTABLE LAMPS.

Two other useful purposes to which secondary cells are applied are (1) the construction of safety lamps for miners, and (2) reading lamps for railway travellers. Since one pound weight will give a capacity of four ampere hours (and it is easy to obtain lamps which can be incandesced with only third of an ampere), it follows that if we use three cells each weighing one pound we can easily get a lamp which can be maintained alight for 12 hours giving a light of about two candles. This is ample for both purposes enumerated; in fact, I habitually travel with such a portable railway reading lamp, and find it of immense service. The battery that I am now showing to you was charged during the last Christmas holidays. I have not travelled since, and it has not lost much of its charge, as you plainly see. I have much pleasure in exhibiting several forms of safety miners' lamps, which have been lent me for the occasion by Mr. Pitkin, their manufacturer. Mr. Swan has done much in this direction, and his lamps are in considerable use, especially in South Wales, and are now exhibited in action.

TELEGRAPHY.

All attempts to use dynamos direct for telegraphic purposes in England have failed, but their use indirectly, by means of secondary batteries, has been eminently successful. At the General Post Office, in London, there are 220 circuits thus worked from only 38 cells. The currents used for telegraphy are very minute compared to those used for electric lighting: .05 ampere, or 50 millamperes, is a large current for such a purpose. Thus the current that would light one 50 watt glow lamp will work 10 telegraphic circuits. The secondary cells are applied thus: 20 cells provide motive power for Delany multiplex distributors, and 120 single needle circuits; 18 cells, or two parallels of nine cells, provide currents for 100 direct inker Morse circuits.

This mode of working has now been in operation since the early part of 1884.

It is quite clear that the secondary battery has passed through the experimental stage, and that it has now reached its commercial career, where it will prove to be a most valuable and indispensable adjunct to the equipment of the electrical engineer.

Babylon Electrified.

Messrs. Gebbie & Company, of Philadelphia, have in press and will soon publish a new and copyright translation of "Babylon Electrique," by A. Bleunard, under the title of "Babylon Electrified." This translation by Frank Linston White will have all the original illustrations by Montader, and be comprised in one handsome volume, 8vo, at a popular price, which we believe will give it a large sale, both among those interested in electricity and others with an interest in Mesopotamia, the cradle land of the human race.

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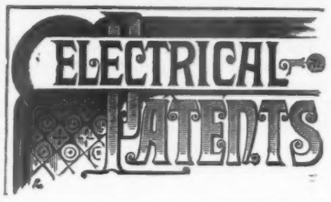
* * The East Nashville, Tenn., Street Railroad Company will probably operate their road by electricity.



INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 4, 1889.

404,426 Unison device; George F. Oehmed, New York, N. Y.
404,438 Non-interfering fire alarm signal box; John H. Ruddick, Richmond, Ind., assignor by mesne assignments to the Interstate Fire Alarm Company, Omaha, Neb.
404,441 Motive mechanism for railway cars; Henry F. Shaw, Boston, and George F. Shaw, Dedham, Mass.
404,457 Railway signal; A. Jackson Wisner, Philadelphia, Pa.
404,463 Filament for incandescent electric lamps; Turner D. Bottom, New York, N. Y.
404,465 Electric motor; Charles S. Bradley, Yonkers, N. Y.
404,466 Alternating current electric motor; Chas. S. Bradley, Yonkers, N. Y.
404,469 Electric railway; William Cannell, Cleveland, Ohio.
404,470 Voltmeter; Leon Daft, Plainfield, N. J.
404,471 Telephone transmitter; Edwin S. Drake, Cambridge, Mass.
404,484 Dynamo-electric machine; William Hochhausen, Brooklyn, N. Y.
404,507 Telegraph apparatus; Ebenezer B. Shafer, New York, N. Y.
404,518 Fire alarm telegraph; Sidney A. Chase, Evart, Mich., assignor of one-half to William R. Mapes, same place.
404,519 Duplex fire telegraph; Sydney A. Chase, Evart, Mich., assignor of one-half to William R. Mapes, same place.
404,533 Electric motor and regulator; Alfred Gartner, Newark, N. J., assignor by mesne assignments to the Continental Motor and Electrical Co., same place.
404,559 Track-moistening apparatus for electric railways; Edward D. Priest, Lynn, Mass.
404,566 Method of distribution by alternating electric currents; Oliver B. Schallenberger, Rochester, assignor to the Westinghouse Electric Company, Pittsburgh, Pa.
404,567 System of generators for alternating electric currents; Oliver B. Schallenberger, Rochester, assignor to the Westinghouse Electric Company, Pittsburgh, Pa.
404,602 Regulator for dynamo-electric machines; Ernest P. Clark, New York, N. Y., assignor to the Clark Electric Company, same place.
404,630 Induction coil; John F. Kelly, Hoboken, N. J., assignor to the United States Electric Lighting Company, same place.
404,651 Safety attachment for electric motors; William S. Paca, Baltimore, Md., assignor of one-half to John P. Paca, same place.
404,661 Electric motor; Henry B. Slater, Detroit, Mich., assignor to the Belding Motor and Mfg. Co., Chicago, Ill.
404,667 Fireman's electric wire cutter; Daniel A. Woodhouse, Elizabeth, N. J., and Thomas V. Forster, Brooklyn, N. Y.
404,680 Telephone support; Charles W. Brown, Montreal, Quebec, Canada, assignor to the Bell Telephone Company, of Canada, same place.
404,687 Electric railroad; Leo Daft, Plainfield, N. J.
404,698 Portable electric lantern; William Friskmuth, Philadelphia, Pa.
404,699 Galvanic battery; William Frishmuth, Philadelphia, Pa.
404,712 Detachable brush holder for dynamos; Jesse F. Kester, Terre Haute, Ind., assignor of three-fourths to Joseph H. Briggs, same place.
404,713 Armature core for dynamos; Jesse F. Kester, Terre Haute, Ind., assignor of three-fourths to Joseph H. Briggs, same place.
404,714 Regulator for dynamo-electric machines or motors; Jesse F. Kester, Terre Haute, Ind., assignor of three-fourths to Joseph H. Briggs, same place.
404,715 Brush spring for dynamos; Jesse F. Kester, Terre Haute, Ind., assignor of three-fourths to Joseph H. Briggs, same place.
404,788 Regulator for electric motors; Alfred Gartner, Newark, N. J.
404,801 Electric meter for alternate currents; Marmaduke M. M. Slattery, Fort Wayne, Ind., assignor to the Fort Wayne Electric Light Company, same place.
404,813 Electric cable terminal; Robert H. Widdicombe, Chicago, Ill., assignor to the Western Electric Company, same place.

PATENTS.

Electrical Review Patent Bureau

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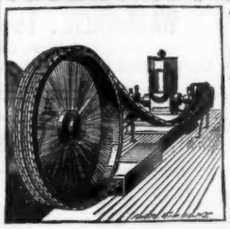

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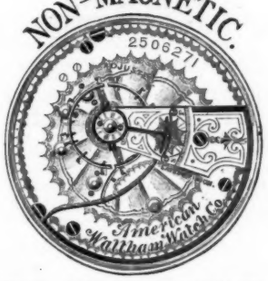

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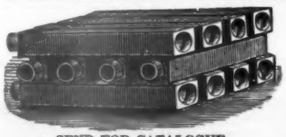

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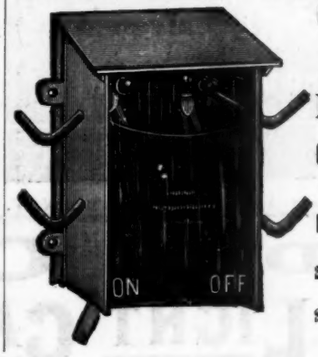

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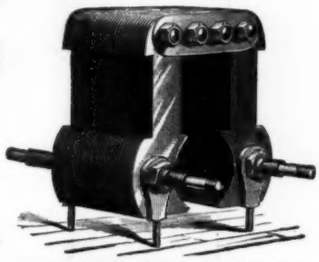

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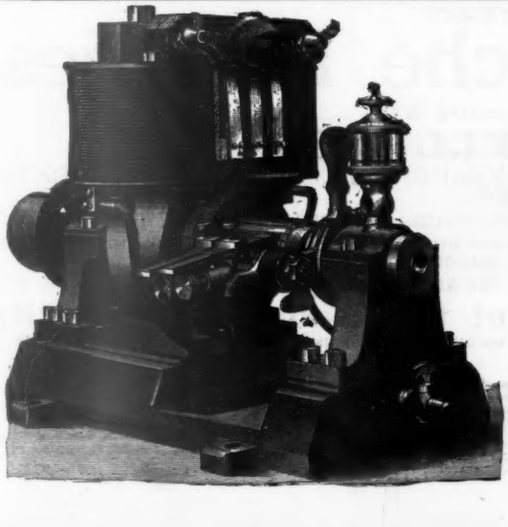

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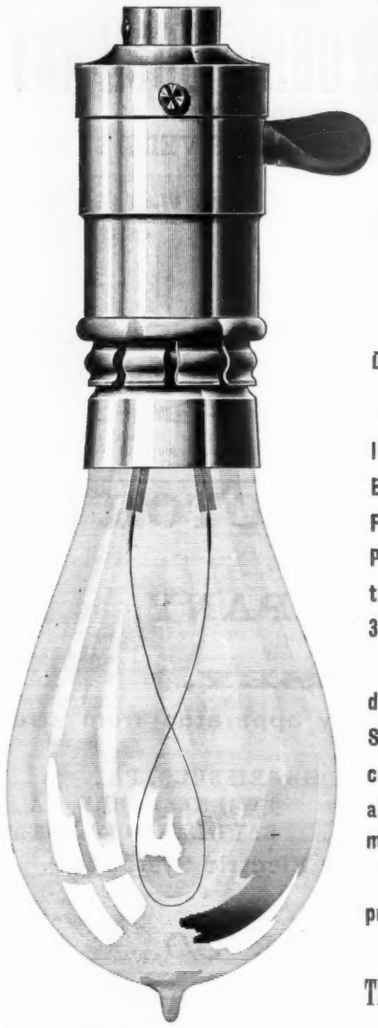

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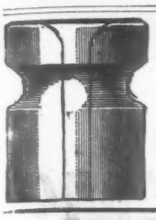

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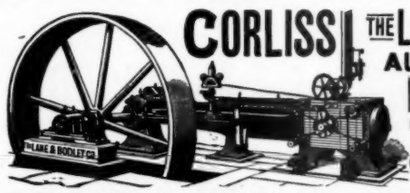

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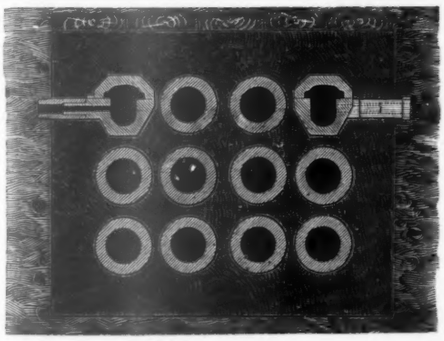

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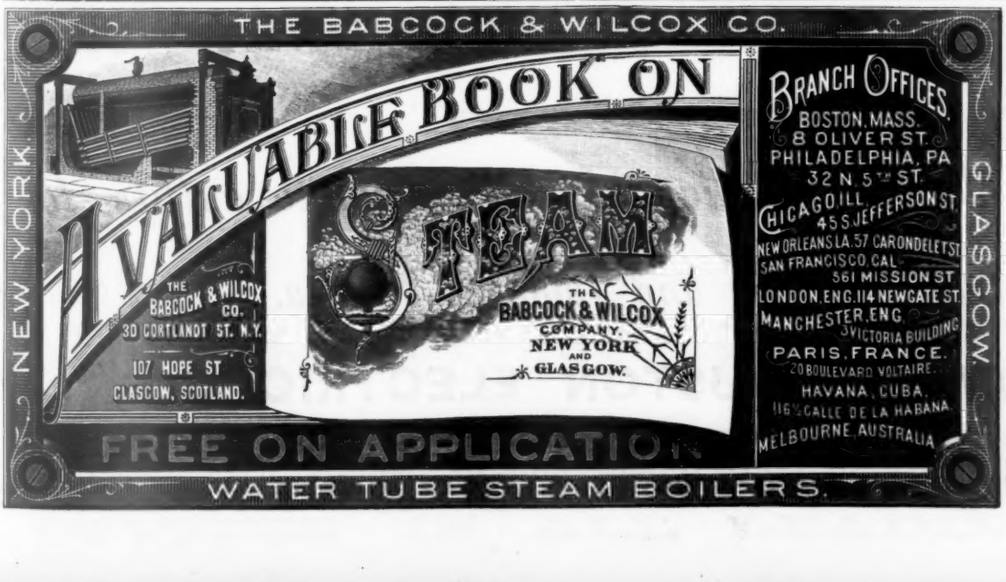
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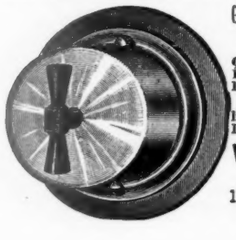

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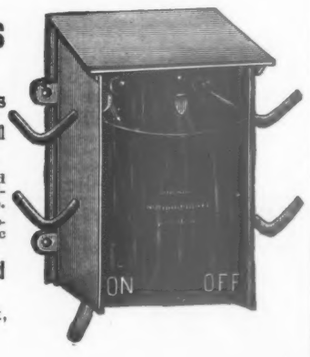

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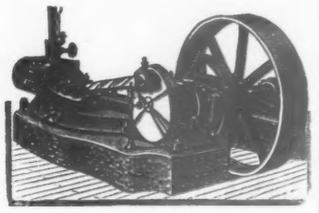

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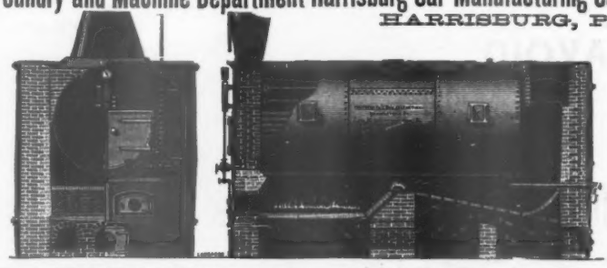

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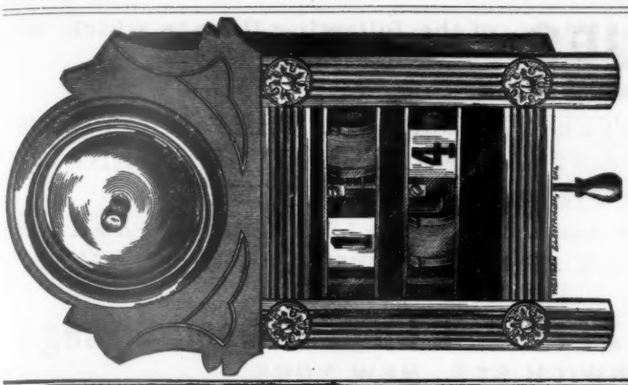

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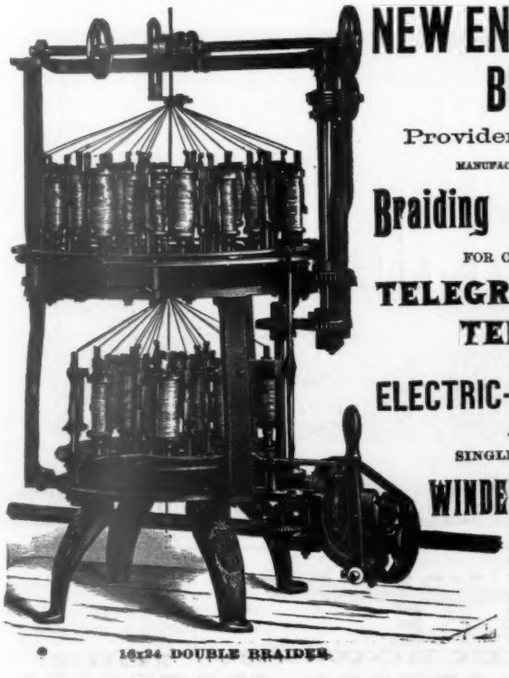

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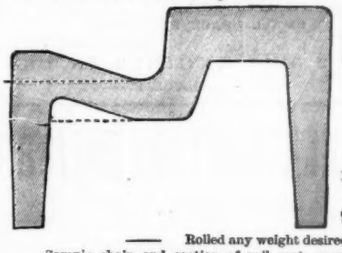

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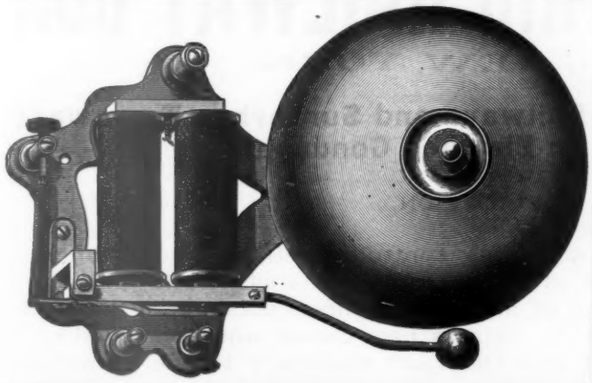

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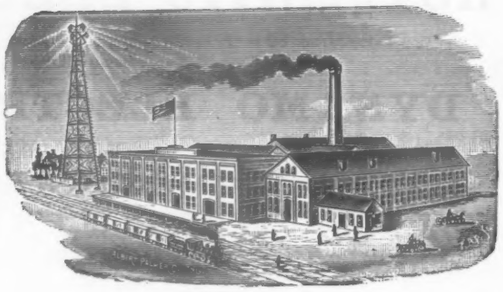

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